

III B. Tech II Semester Regular Examinations, April - 2016

UTILIZATION OF ELECTRICAL ENERGY

(Electrical and Electronics Engineering)

Time: 3 hours

Maximum Marks: 70

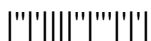
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2. Answering the question in **Part-A** is compulsory3. Answer any **THREE** Questions from **Part-B**

PART -A

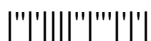
- 1 a) "If a high degree of speed control is required, d.c. is preferable to a.c. for an electric drive" -Justify. [4M]
- b) What do you mean by Load Equalization? [3M]
- c) Give the classification of electric heating methods. [3M]
- d) Define: i) Mean spherical Candlepower, ii) Mean horizontal Candlepower. [4M]
- e) Why a series motor is preferred for the electric traction. [4M]
- f) What are the advantages of electric braking over mechanical braking [4M]

PART -B

- 2 a) Discuss the advantages and disadvantages of electric drive over other drives. [8M]
- b) A 200 V shunt motor has an armature resistance of 0.5 Ohm. It takes a current of 16 amps on full load and runs at 600 r.p.m. If a resistance of 0.5 ohm is placed in the armature circuit, find the ratio of the starting torque to the full load torque. [8M]
- 3 a) Explain in brief how heating is done in the following cases: [8M]
i) Resistance heating, ii) Induction heating iii) Dielectric heating.
- b) A 20KW single-Phase, 220V resistance oven employs circular nichrome wire for its heating element, if the wire temperature is not to exceed 1227° and the temperature of the charge is to be 427°C , calculate the size and length of the wire required. Assume emissivity = 0.9, radiating efficiency = 0.6 and specific resistance of wire = $1.09 \times 10^{-6} \Omega\text{-m}$. [8M]
- 4 a) Explain the different measurement techniques used for luminous intensity. [8M]
- b) A lamp fitted with 120 degrees angled cone reflector illuminates circular area of 200 metre in diameter. The illumination of the disc increases uniformly from 0.5 metre-candle at the edge to 2 metre-candle at the centre. Determine [8M]
i. the total light received
ii. Average illumination of the disc
iii. Average c.p. of the source.



- 5 a) Compare Tungsten filament lamp with Fluorescent tubes. [8M]
b) Explain the different types of lighting schemes.. [8M]
- 6 a) For a quadrilateral speed-time curve of an electric train, derive expression for the distance between stops and speed at the end of the coasting period [8M]
b) A train is required to run between stations 1.6kms apart at an average speed of 40km/hr. The run is to be made from a quadrilateral speed-time curve. The acceleration is 2km/hr/sec. The coasting and braking retardations are 0.16km/hr/sec and 3.2km/hr/sec respectively. Determine the duration of acceleration, coasting and braking and the distance covered in each period. [8M]
- 7 a) Briefly explain the a.c. motors used in traction. [8M]
b) The scheduled speed of a trolley service is to be 53km/hr. The distance between stops is 2.8km. The track is level and each stop is of 30 sec duration. Using simplified speed-time curve, calculate the maximum speed, assuming the acceleration to be 2km/hr/sec, retardation 3.2km/hr/sec, the dead weight of the car as 16 tonnes, rotational inertia as 10% of the dead weight and track resistance as 40 newtons/tonne. If the overall efficiency is 80%, calculate (i) the maximum power output from the driving axles (ii) the specific energy consumption in watt-hr/tonne-km. [8M]



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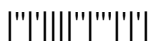
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PART -A

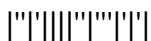
- 1 a) " Torque in a shunt motor varies with the armature current" –Justify [4M]
- b) What are various types of electric braking used? [4M]
- c) Discuss the various losses that occur in insulating materials [4M]
- d) Define i)Mean hemispherical Candlepower [3M]
ii) Mean spherical Candlepower.
- e) What is plugging. [3M]
- f) What is the principle of energy efficient motors. [4M]

PART -B

- 2 a) Compare and contrast the slip ring and squirrel cage induction motors from the application point of view. [8M]
- b) A series motor working on 500 V d.c supply runs at a speed of 1000 r.p.m. When The load current is 120 amp. The resistance of the motor 0.15 ohm, of which 0.04 ohm is the resistance of the field. Calculate the speed of the motor when the torque is half of the full load torque and the field winding is connected in parallel with a diverter of resistance 0.08 ohm, assuming an unsaturated magnetic circuit. [8M]
- 3 a) What are the causes of failure in heating elements? [5M]
- b) Six resistances each of 40 ohms are used as heating elements in furnace. Find the power of the furnace for various connections to a three phase 230V supply. [6M]
- c) An electric arc furnace consuming 5kW takes 15 minutes to just melt 1.5kg of aluminum, the initial temperature being 15° C. Find the efficiency of the furnace. Specific heat of aluminum is 0.212, melting point 658° C and latent heat of fusion is 76.8 cal per gram. [5M]
- 4 a) State and explain laws of Illumination. [8M]
- b) A lamp of 500 candle power is placed at the centre of a room, 20m×10m×5m. Calculate the illumination in each corner of the floor and a point in the middle of a 10m wall at a height of 2m from floor. [8M]
- 5 Give the construction and working of the following types of lamps: [16M]
(a) Arc lamp (b) Neon lamp (c) Sodium lamp



- 6 a) For a trapezoidal speed-time curve of an electric train, derive expression for maximum speed and distance between stops. [10M]
- b) A train is to be run between two stations 5kms apart at an average speed of 50km/hr. If the maximum speed is to be limited to 70km/hr, acceleration to 2km/hr/sec, braking retardation to 4km/hr/sec and coasting retardation to 0.1km/hr/sec, determine the speed at the end of coasting, duration of coasting period and braking period. [6M]
- 7 a) Write short notes on sub-traction for single-phase A.C systems. [6M]
- b) An electric locomotive is required to haul a train of 12 coaches each weighing 30 tonne on the main line service requiring an initial acceleration of 0.8km/hr/sec up a gradient of 1 in 100. Estimate the adhesive weight and hence the number of driving axles the locomotive must have, if the permissible axle loading is 20 tonne per axle. Assuming for rotational inertia to be 4%, for the coaches and 15% for the locomotive. Maximum coefficient of adhesion is 0.2 and the tractive resistance 5kg/tonne. [10M]



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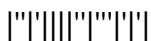
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PART -A

- 1 a) What do you mean by "Individual drive" and "Group drive". [4M]
 b) Define Horizontal polar curve and vertical polar curve. [4M]
 c) What are the advantages of radiant heating? [3M]
 d) Discuss inverse square law. [3M]
 e) What are the advantages and disadvantages of electrification of track? [4M]
 f) Discuss why a D.C series motor is ideally suited for traction services. [4M]

PART -B

- 2 a) Though a.c. is superior to d.c. for electric drives, sometimes d.c. is preferred. Give the reasons and mention some of the applications. [8M]
 b) A d.c. series motor drives a load, the torque of which varies as the square of the speed. The motor takes current of 30 amps, when the speed is 600 r.p.m. Determine the speed and current when the field winding is shunted by a diverter, the resistance of which is 1.5 times that of the field winding. The losses may be neglected. [8M]
- 3 a) What are various types of electric braking used? [8M]
 b) Explain how rheostatic braking is done in D.C. shunt motors and series motors. [8M]
- 4 Write short notes on : [8M]
 a) High pressure mercury vapour lamp
 b) Mercury fluorescent lamp. [8M]
- 5 a) Explain the various types of lighting schemes with relevant diagrams. [10M]
 b) Briefly explain the various laboratory standards used in Illumination. [6M]
- 6 Write a brief notes on the single phase a.c. series motor and comment upon its suitability for traction services. How is its performance compared with the d.c. series motor? [16M]
- 7 a) Explain the specific energy consumption for given run. [8M]
 b) An electric train weighing 200 tonne has 8 motors geared to driving wheels, each wheel is of 80cms diameter. Determine the torque developed by each motor to accelerate the train to a speed of 48km/hr in 30seconds up a gradient of 1 in 200. The tractive resistance of 50newtons/tonne, the effect of rotational inertia is 10% of the train weight, the gear ratio is 4 in 1 and gearing efficiency is 80%. [8M]



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PART -A

- 1 a) What are the various factors that govern the choice of a motor for a given service? [3M]
- b) What are different methods of heat transfer? [4M]
- c) Define: i) Luminous intensity, ii) Luminous Flux. [4M]
- d) Give some applications of induction heating. [3M]
- e) What are the requirements of an ideal traction system? [4M]
- f) Define specific energy output and specific energy consumption. [4M]

PART -B

- 2 a) Explain what do you mean by "Individual drive" and "Group drive ". Discuss their relative merits and demerits. [8M]
- b) A 500 V d.c. series motor runs at 500 r.p.m. and takes 60 amps. The resistances of the field and the armature are 0.3 and 0.2 Ohms, respectively. Calculate the value of the resistance to be shunted with the series field winding in order that the speed may be increased to 600 r.p.m., if the torque were to remain constant. Saturation may be neglected. [8M]
- 3 a) What are the factors to be considered for inductor design in induction heating? [8M]
- b) Give some applications of induction heating. [8M]
- 4 a) Explain with sketches the constructional features of a filament lamp. [10M]
- b) A lamp of 500 candle power is placed at the centre of a room, 20m x 10m x 5m. Calculate the illumination in each corner of the floor and a point in the middle of a 10m wall at a height of 2m from floor. [6M]
- 5 a) Discuss the flood lighting with suitable diagrams. [6M]
- b) Along the center of a line of a corridor, number of lamps is fitted with reflectors. The distance between the two adjacent lamps is 7.5cm and the height of each lamp from the floor is 5m. The candlepower of each lamp is 100 in all directions below the horizontal. Determine the maximum and minimum illumination along the centerline of the floor and draw a graph showing the variation of the illumination along this line between the two lamps. [10M]



- 6 a) Draw the speed-time curve of a suburban service train and explain [8M]
- b) A train accelerates to a speed of 48km/hr in 24sec. Then it coasts for 69sec under a constant resistance of 58 newton / tonne and brakes are applied at 3.3km/hr/sec in 11sec. calculate (i) the acceleration (ii) the coasting retardation (iii) the scheduled speed if station stoppage is 20secs. What is the effect of scheduled speed if station stoppage is reduced to 15sec duration, other conditions remaining same? Allow 10% for rotational inertia. [8M]
- 7 a) Explain dead weight, accelerating weight and train resistance referred to traction. [6M]
- b) An electric locomotive of 100 tonne can just accelerate a train of 500 tonne (trailing weight) with an acceleration of 1km/hr/sec on an up gradient 1 in 1000. Tractive resistance of the track is 45 newton/tonne and the rotational inertia is 10%. If this locomotive is helped by another locomotive of 120 tonne, find [10M]
- i) the trailing weight that can be hauled up the same gradient, under the same condition
- ii) the maximum gradient, the trailing hauled load remaining unchanged. Assume adhesive weight expressed as percentage of total dead weight to be same for both the locomotives.



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DESIGN OF MACHINE MEMBERS- II
(Mechanical Engineering)

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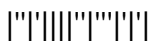
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PART -A

- 1 a) Write a short note on classification of antifriction bearings. [4M]
- b) Explain the various types of stresses induced in the connecting rod. [3M]
- c) Explain the design procedure of studs size for the cylinder head. [3M]
- d) What are the various types of stresses induced in crane hooks? [4M]
- e) With the help of sketches, discuss about the various types of belt joints. [4M]
- f) State the application of various types of levers. [4M]

PART -B

- 2 a) Explain the following terms: [4M]
 i) Static load carrying capacity, ii) Dynamic load carrying capacity
- b) A journal bearing of 50mm diameter and 80mm long, has a bearing pressure of 6 N/mm², the speed of the journal is 1000 rpm. The ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil, whose absolute viscosity at the operating temperature of 75⁰C may be taken as 0.015 kg/m-s. The room temperature is 25⁰C, Determine (i) the amount of artificial cooling required and (ii) the mass of the coolant oil required, if the difference between the outlet and inlet temperature of the oil is 10⁰C. the specific heat of the oil is 1900 J/kg⁰C and heat dissipation coefficient is 500 W/m²/⁰C. [12M]
- 3 a) Design a center crank shaft for a single acting four stroke engine for the following [16M]
 data: Bore = 200mm, stroke = 300mm, engine speed = 1000 rpm, length of connecting rod = 600mm, Maximum combustion pressure = 1 N/mm², the crank shaft carrying one fly wheel at one end of each journal. Weight of each flywheel = 2 kN, distance between flywheel and its nearest journal = 150 mm.
 Maximum torque is experienced in the crank shaft when the crank angle is 30⁰ from inner dead center position. Permissible stresses for crank shaft material are 70 N/mm² in bending, 40 N/mm² in shear, limiting bearing pressure is 8 N/mm². The length to diameter ratio 1.2 for both crank pin and journal. Assume required data.



- 4 Design a cast iron piston for a single acting four stroke diesel engine with the following data [16 M]
 Cylinder bore = 300mm
 Length of stroke = 250mm
 Speed = 600 rpm
 Brake mean effective pressure = 0.6 MPa
 Maximum gas pressure = 4MPa
 Fuel consumption = 0.25 kg per BP per h
 l/d ratio for bush in small end of connecting rod = 1.5
 Assume suitable data if required and state the assumptions made.
- 5 a) Why Trapezoid cross-section is preferred for crank hook? [6M]
 b) A curved bar of rectangular section, initially unstressed, is subjected to bending moment of 1400 N-m which tends to straighten the bar. The section is 4 cm wide by 5 cm deep in the plane of bending, and the mean radius of curvature is 10 cm. Find the position of the neutral axis and magnitudes of the greatest bending stress and draw a diagram to show approximately how the stress varies across the section. [10M]
- 6 a) A flat belt is required to transmit 30 kW from a pulley of 1.5m effective diameter running at 300 rpm. The angle of contact is spread over $11/24$ of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine taking centrifugal tension in to account, width of the belt required. It is given that the belt thickness is 9.5 mm. density of belt material is 100 kg/m^3 and the permissible working stress is 2.5 MPa. [8M]
 b) The lead screw of lathe has ACME threads of 50mm outside diameter and 8 mm pitch. The screw must exert an axial pressure of 2500N in order to drive the tool carriage. The thrust is carried on a collar 110mm outside diameter and 55mm inside diameter and lead screw rotates at 30r.p.m. Derive i)the power required to drive the screw, ii) the efficiency of the lead screw. Assume coefficient of friction of 0.15 for screw and 0.12 for collar. [8M]
- 7 a) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° , while the helix angle is 25° , the face width is 40 mm and the normal module is 4 mm. the pinion as well as gear is made of steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$) and heat treated to a surface hardness of 300 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of gears. [8M]
 b) A cranked lever has the following dimensions: Length of the handle = 300 mm, Length of the lever arm = 400mm, overhang of the journal = 100 mm. if the lever is operated by a single person exerting a maximum force of 400 N at a distance of $1/3^{\text{rd}}$ length of the handle from its free end, find i) diameter of the handle ii) cross section of the lever arm iii) diameter of the journal. [8M]
 The permissible bending stress for the lever material may be taken as 50 MPa and shear stress for shaft material as 40 Mpa.



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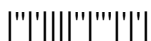
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PART -A

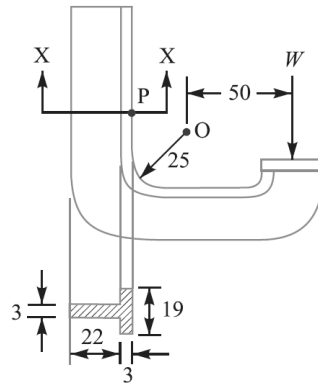
- 1 a) Define the following terms related to rolling contact bearings: [4M]
i) Bearing life ii) Reliability.
- b) Explain the design procedure of a connecting rod big end cap bolts. [3M]
- c) Explain the various types of cylinder liners. [4M]
- d) Derive an expression for radius of neutral axis of a rectangular cross- section curved beam. [4M]
- e) Classify the wire ropes, based on the direction of twist. [3M]
- f) Define the following [4M]
i) Normal pitch ii) Axial pitch

PART -B

- 2 a) State any four advantages of Rolling contact bearings over sliding contact bearings. [4M]
b) Design a full hydrodynamic journal bearing with the following specifications for [12M]
machine tool application
Journal diameter = 75mm
Radial load = 10 kN
Journal speed = 1440 rpm
Minimum oil film thickness = 22.5 microns
Inlet temperature = 40°C
Bearing material = Babbitt
Determine the length of the bearing and select a suitable oil.
- 3 Design an overhung crank shaft for a 300 X 350 mm single cylinder vertical engine [16M]
using following data:
Maximum gas pressure = 2.5 MPa
(L/r) ratio = 4.5
Weight of flywheel cum belt pulley = 10 kN
Total belt pull = 5 kN
Width of hub for flywheel cum belt pulley = 150 mm
The torque on the crank shaft is maximum when the crank turns through 35° from the top dead center and at this position the gas pressure inside the cylinder is 1MPa. The belts are in the horizontal direction. Assume suitable data.
- 4 Design a cast iron piston for a single acting four stroke engine for the following data: [16M]
Cylinder bore = 100mm, stroke = 125mm, maximum gas pressure = 5 N/mm²,
Induced mean effective pressure = 0.75 N/mm², mechanical efficiency = 80%, fuel
consumption = 0.15 kg per BP per hour, higher calorific value = 42 X 10³ kJ/kg,
speed = 2000 rpm, assume suitable data if required and state the assumptions made.



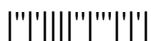
- 5 a) What are the applications of curved beams? [2M]
 b) A C-Clamp is subjected to a maximum load of W as shown in fig. if the maximum tensile stress in the clamp is limited to 140 MPa, find the value of load W . [14M]



Section of X-X

All dimensions in mm.

- 6 a) It is required to select a flat open belt drive for a compressor running at 720 rpm, which is driven by a 25 kW, 1440 rpm motor space is available for a center distance of 3m. [8M]
 b) A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of screw collar are 50mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 rpm. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm^2 . Find [8M]
 i) The torque required to rotate the screw
 ii) The stresses in the screw and
- 7 a) A pair of straight teeth spur gears is to transmit 20 kW when the pinion rotates at 300 rpm. The velocity ratio is 1:3. The allowable static stresses for the pinion and gear materials are 120 MPa and 100 MPa respectively. The pinion has 15 teeth and its face width is 14 times the module. Determine i) Module ii) face width iii) pitch circle diameters of both the pinion and gear from the stand point of strength only, taking into consideration the effect of the dynamic loading. The tooth form factor can be taken as $y = 0.154 \frac{0.912}{\text{no. of teeth}}$ and the velocity factor $C_v = \frac{3}{3+v}$ where v is expressed in m/sec [8M]
 b) State the applications of hand and foot levers. Discuss the procedure for designing a hand or foot lever. [8M]



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PART -A

- 1 a) What are the commonly used materials for sliding contact bearings? [3M]
- b) Explain the various types of crank shafts. [3M]
- c) Explain the function of piston rings. [4M]
- d) Draw the distribution of stresses in curved beams across the cross section. [4M]
- e) Differentiate between differential screw and compound screw. [4M]
- f) Define i) Module, ii) Face width. [4M]

PART -B

- 2 a) Distinguish between “Hydrodynamic bearings” and “Hydrostatic bearings”. [4M]
- b) A single row deep groove ball bearing is subjected to a radial load of 8 kN and a axial load of 3 kN. The shaft rotates at 1200 rpm. The expected life of the bearing is 20000 hours. The minimum acceptable diameter of the shaft is 75mm. select a suitable ball bearing for this application. [12M]
- 3 The following data is given for the connecting rod of a diesel engine: Cylinder bore = 85 mm, Length of connecting rod = 350 mm, Maximum gas pressure = 3 MPa, factor of safety against the buckling failure = 5, l/d ratio for piston pin bearing = 1.5, l/d ratio for crank pin bearing = 1.25, Allowable bearing pressure for piston pin bearing = 13 MPa, Allowable bearing pressure for crankpin bearing = 11 MPa, stroke length = 140mm, mass of reciprocating parts = 1.5kg, engine speed = 2000 rpm, allowable stress in the bolts as 90 N/mm^2 and in cap as 95 N/mm^2 , density of connecting rod = 7800 kg/m^3 calculate: [16M]
 - a) Dimensions of the cross section of connecting rod
 - b) Dimensions of small and big end bearings
 - c) Nominal diameter of bolts for the cap
 - d) Thickness of cap and
 - e) Magnitude of whipping stress.



- 4 A cylinder of a four stroke diesel engine has the following specifications: [16M]
Brake power = 5 kW
Speed = 600 rpm
Indicated mean effective pressure = 0.5 MPa
Make suitable assumptions and calculate
a) Bore and length of the cylinder liner
b) Thickness of the cylinder liner
c) Thickness of the cylinder head
d) Size, number and pitch of studs.
- 5 a) Derive an expression for radius of neutral axis of a 'I' cross- section curved beam. [6M]
b) A central horizontal section of a hook is symmetrical trapezium 60 mm deep, the inner width being 60 mm and the outer width being 30 mm. Estimate the extreme intensities of stresses when the hook carries a load of 20 kN. the load line passes at 40 mm from the inside edge of the section and the center of curvature lies in the load line. [10M]
- 6 a) It is required to select a V belt drive to connect a 15 kW, 2880 rpm normal torque A C Motor to a centrifugal pump, running at approximately 2400 rpm, for a service of 18 hours per day. The center distance should be approximately 400mm. assume that the pitch diameter of the driving pulley is 125mm [8M]
b) A vertical two start square threaded screw of a 100 mm diameter and 20mm pitch supports a vertical load of 18kN. The axial thrust on the screw is taken by a collar bearing of 250mm outside diameter and 100 mm inside diameter. Find the force required at the end of a lever of 400 mm long in order to lift and lower the load. The coefficient of friction for the vertical screw and nut is 0.15 and that for collar bearing is 0.20. [8M]
- 7 a) A pair of helical gears is to transmit 15 kW. The teeth are 20⁰ stub in diametral plane and have a helix angle of 45⁰. The pinion runs at 10000 rpm and has 80mm pitch diameter. The gear has 320 mm pitch diameter. if the gears are made of cast steel having allowable static strength of 100 MPa, determine a suitable module and face width from static strength considerations and check the gears for wear, given $\sigma_{es} = 618$ MPa [10M]
b) A foot lever is 1m from the center of the shaft to the point of application of 800N load. Find i) diameter of the shaft ii) dimensions of the rectangular arm of the foot lever at 60 mm from the center of the shaft assuming width of the arm as three times the thickness. The allowable tensile stress may be taken as 73 MPa and allowable shear stress as 70 MPa. [6M]



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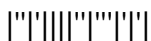
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PART -A

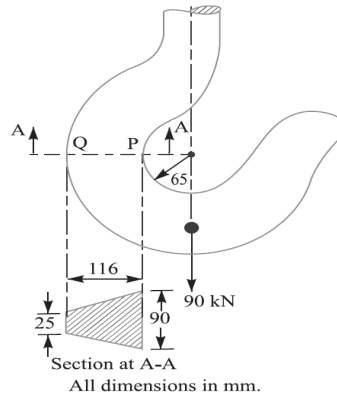
- 1 a) Define the terms: [4M]
 i) Bearing characteristic number ii) Bearing modulus
 b) What are the various types of stresses induced in the crank shaft? [4M]
 c) Explain the properties required for the piston materials. [4M]
 d) What are the assumptions made in Winkler-Bach Theory? [4M]
 e) Name the type of stresses induced in the wire ropes. [3M]
 f) Explain about herring bone gear. [3M]

PART -B

- 2 a) Explain the various types of lubrication. [4M]
 b) Select a single row deep groove ball bearing for a radial load of 4000N and an axial load of 5000N, operating at a speed of 1600rpm for an average life of 5 years at 10 hours per day. Assume uniform and steady load. [12M]
- 3 Design a connecting rod for an IC engine running at 1800 rpm and developing a maximum pressure of 3.15 N/mm^2 . The diameter of the piston is 100mm, mass of the reciprocating parts per cylinder 2.25kg, length of connecting rod 380 mm, stroke of piston 190 mm and compression ratio 6:1. take factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressure as 10 N/mm^2 and 15 N/mm^2 . The density of rod material may be taken as 8000 kg/m^3 and the allowable stress in the bolts as 60 N/mm^2 and in cap as 80 N/mm^2 . Assume I cross section for the connecting rod. The elastic limit of compressive stress is 350 MPa and rankine constant 1/7500. Draw a neat dimensioned sketch. [16M]
- 4 A four stroke diesel engine has the following specifications [16M]
 Brake power = 5 kW, Speed = 1200 rpm, indicated mean effective pressure = 0.35 N/mm^2 , Mechanical efficiency = 80%. Determine
 i) Bore and length of the cylinder ii) Thickness of the liner
 iii) Thickness of the cylinder head iv) Size, number and pitch of studs.



- 5 a) Define curved beam? What is the difference with respect to straight beam [4M]
 b) A crane hook has a trapezoidal section at A-A as shown in fig. find the maximum stress at points P and Q [12M]



- 6 a) Design a chain drive to actuate a compressor from a 15 kW electric motor running at 1000 rpm. The compressor speed being 350 rpm. The minimum center distance is 500 mm. the compressor operates 16 hours per day. The chain tension may be adjusted by shifting the motor on sliders [8M]
 b) A nominal diameter of a triple threaded square screw is 50mm, while the pitch is 8 mm. it is used with a collar having an outer diameter of 100mm and inner diameter as 65mm. the coefficient of friction at the thread surface as well as at the collar surface can be taken as 0.15. the screw is used to raise a load of 15 kN. using the uniform wear theory for collar friction, calculate [8M]
 i) Torque required to raise the load ii) Torque required to lower the load and
 iii) The force required to raise the load, if applied at a radius of 500 mm
- 7 a) Design a pair of spur gears with 20° full-depth involute teeth consisting of a 20 teeth pinion meshing with a 50 teeth gear. The pinion shaft is connected to a 22.5 kW, 1450 rpm electric motor. The starting torque of the motor can be taken as 150% of the rated torque. The material for the pinion is plain carbon steel Fe410 ($S_{ut} = 410 \text{ N/mm}^2$), while the gear is made of grey cast iron FG200 ($S_{ut} = 200 \text{ N/mm}^2$). The factor of safety is 1.5. design the gears based on the Lewis equation and using velocity factor to account for the dynamic load [10M]
 b) A right angled bell crank lever is to be designed to raise a load of 5 kN at the short arm end. The lengths of short and long arms are 100 and 450 mm respectively. The lever and the pins are made of steel 30C8 ($S_{ut} = 400 \text{ N/mm}^2$). And the factor of safety is 5. the permissible bearing pressure on the pin is 10 N/mm^2 . The lever has a rectangular cross section and the ratio of width to thickness is 3:1. The length to diameter ratio of the fulcrum pin is 1.25:1. Calculate i) the diameter and length of the fulcrum pin ii) the dimensions of the cross section of the lever [6M]



III B.Tech II Semester Regular Examinations, April - 2016
COMPUTER NETWORKS
(Common to CSE and IT)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

PART -A

- | | | |
|---|--|------|
| 1 | a) Explain in detail about the MAN. | [4M] |
| | b) Discuss briefly about the multilevel multiplexing. | [3M] |
| | c) What is Piggybacking? Explain the advantage of it. | [3M] |
| | d) Explain in detail about the Broadcasting. | [4M] |
| | e) Discuss in detail about the Manchester Encoding. | [4M] |
| | f) Explain in detail about the HTTP Response Message format. | [4M] |

PART -B

- | | | |
|---|--|------|
| 2 | a) Explain in detail about the Novell Network. | [8M] |
| | b) Discuss how Internet has revolutionized many aspects of our daily lives | [8M] |
| 3 | a) Explain in detail about the statistical time division multiplexing | [8M] |
| | b) Compare and contrast a circuit-switched network and a packet-switched network | [8M] |
| 4 | a) What are the services provided to the Network Layer by Data Link Layer? Explain. | [6M] |
| | b) Given 1101011011 data frame and generator polynomial $G(x) = x^4 + x + 1$. Derive the transmitted frame. | [5M] |
| | c) Explain in detail about the Simplex protocol for Noisy channel. | [5M] |
| 5 | a) Describe in detail about the Frequency Division Multiple Access. | [8M] |
| | b) Explain briefly about the shortest path routing algorithm. | [8M] |
| 6 | a) Explain in detail about the Physical layer in the Fast Ethernet. | [8M] |
| | b) Discuss briefly about the MAC layers in the 802.11 standard. | [8M] |
| 7 | a) Explain in detail about the Client and Server in World Wide Web. | [8M] |
| | b) Describe briefly about the HTTP Operational Model. | [8M] |



III B.Tech II Semester Regular Examinations, April - 2016
COMPUTER NETWORKS
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 3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) Write a short note on ARPANET. [4M]
- b) Compare and contrast a circuit-switched network and a packet-switched network. [4M]
- c) Describe the significance of error detection and error correction mechanisms in data link layer. [3M]
- d) Explain in detail about the Time division Multiple Access. [4M]
- e) Write a short note on Medium Access Control. [3M]
- f) Explain the need of Uniform Resource Locator in WWW. [4M]

PART -B

- 2 a) Explain different Layers and their functionalities in TCP/IP Model. [8M]
- b) Discuss in detail about the LAN and WAN. [8M]
- 3 a) Explain briefly about the applications of FDM [4M]
- b) Explain in detail about the synchronous time division multiplexing. [6M]
- c) Explain in detail about the Efficiency and Delay in Datagram Networks. [6M]
- 4 a) Explain in detail about the sliding window protocol using Selective Repeat. [8M]
- b) Give a brief note on the Multilink Point to point protocol. [8M]
- 5 a) Explain how slotted aloha improves the performance of pure aloha. [6M]
- b) Discuss briefly about the token passing. [4M]
- c) What is Count to infinity problem? Explain with suitable example. [6M]
- 6 a) Compare HDLC Frame with the LLC and MAC frame formats. [8M]
- b) Explain in detail about the addressing mechanism in 802.11. [8M]
- 7 a) Explain briefly about the Architecture of WWW. [8M]
- b) What are the different request types available in HTTP? Explain. [8M]



III B.Tech II Semester Regular Examinations, April - 2016
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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) Explain briefly about the Novell Networks. [4M]
- b) What is the role of the address field in a packet traveling through a datagram network? Explain. [4M]
- c) What is the need of Framing? Explain. [3M]
- d) Compare and contrast the differences between broadcast routing and multicast routing. [3M]
- e) Explain in detail about the Logical Link Control. [4M]
- f) Discuss the HTTP Generic Message format. [4M]

PART -B

- 2 a) Compare OSI Reference Model with the TCP/IP Model. [8M]
- b) Differentiate LAN, MAN and WAN network topologies. [8M]
- 3 a) What is Frequency Division Multiplexing? Explain Multiplexing process in Frequency Division Multiplexing with a suitable example. [8M]
- b) What are the two phases required in the Setup phase in Virtual Circuit? Explain. [8M]
- 4 a) Explain briefly about one-bit sliding window protocol. [8M]
- b) Explain in detail about the point-to-point protocol frame format. [8M]
- 5 With a suitable example explain Distance Vector Routing algorithm. What is the serious drawback of Distance Vector Routing algorithm? Explain. [16M]
- 6 a) What are the common Standard Ethernet implementations? [8M]
- b) Explain the fields in the 802.11 Frame Structure. [8M]
- 7 a) What is the use of Uniform Resource Locator for the Client? Explain. [8M]
- b) Give a brief note on Wireless application protocol. [8M]



III B.Tech II Semester Regular Examinations, April - 2016
COMPUTER NETWORKS
(Common to CSE and IT)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) Explain in detail about the LAN. [4M]
- b) Compare synchronous time division multiplexing with statistical time division multiplexing [3M]
- c) Compare and contrast flow control and error control. [3M]
- d) Discuss the drawbacks of flooding and distance vector routing algorithms. [4M]
- e) Explain maximum and minimum frame lengths in Ethernet. [4M]
- f) Discuss in detail about the HTTP Request Message format. [4M]

PART -B

- 2 a) What are the different Layers in the OSI Reference Model? Explain the Functionalities of each Layer. [12M]
- b) Give a brief note on MAN. [4M]
- 3 a) What is multiplexing? Explain the basic format of multiplexed system. [6M]
- b) Explain in detail about the Wavelength Division Multiplexing. [6M]
- c) Discuss briefly about the multiple slot allocation. [4M]
- 4 a) What is the problem in Go-Back-N protocol? How it can be solved. [8M]
- b) Draw and explain HDLC frame format. [8M]
- 5 a) Write a short note on Fast Ethernet. [8M]
- b) Describe in detail about the Hierarchical routing. [8M]
- 6 a) Explain in detail about the 802.3 MAC frame format and its fields. [8M]
- b) What are the common Fast Ethernet implementations? [8M]
- 7 a) Give a brief note on the HTTP Transaction. [8M]
- b) What are the different Status Codes available in HTTP? Explain. [8M]



Code No: **R32023**

R10

Set No. 1

III B.Tech II Semester Supplementary Examinations, April - 2016
UTILIZATION OF ELECTRICAL ENERGY
(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

- 1 a) Discuss various types of industrial loads with load characteristics. [7]
b) Give with reasons the type of application for which the following motors are best suited: [8]
(i) DC shunt motor (ii) DC series motor
(iii) Synchronous motor (iv) 3-Phase induction motor.
- 2 a) Explain the principle of dielectric heating and list out its applications. [7]
b) Explain the operation of direct and indirect electric arc furnaces. [8]
- 3 a) Compare the AC and DC systems of welding methods. [7]
b) Briefly explain resistance welding and spot welding. Mention their applications. [8]
- 4 a) Explain about Laws of illumination [7]
b) A lamp has a uniform candle power of 300 in all directions and is fitted with a reflector with direct 50% of the total emitted light uniformly on to a flat circular disc of 20 m diameter placed 20 m vertically below the lamp. Calculate illumination: [8]
i. at the centre ii. at the edge of surface with and without reflector.
- 5 a) Write about various lighting schemes. [7]
b) Explain the operation of Mercury vapor lamp. [8]
- 6 a) Discuss in detail about systems of track electrification. [7]
b) The average speed of a train is 50 kmph. Determine its maximum speed assuming trapezoidal Speed-Time curve, if the distance between the stops is 2.5 km, acceleration 1.8 kmphs and retardation 3kmphs. [8]
- 7 a) Derive an equation to determine tractive effort exerted by the traction unit. [7]
b) A 400 tonne goods train is to be hauled by a locomotive up a gradient of 20% with acceleration of 1.5 kmphs. Coefficient of adhesion is 20%, track resistance 40N/tonne and effective rotating masses 10% of dead weight. Find the weight of locomotive and number of axles, if the axle load is not to increase beyond 20 tonne. [8]
- 8 Explain the energy efficiency techniques of Demand side management in detail. [15]



Code No: R32033

R10

Set No. 1

III B.Tech II Semester Supplementary Examinations, April - 2016

HEAT TRANSFER
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

- 1 a) Derive the one-dimensional, steady state heat conduction equation with internal heat generation by writing the energy balance for a differential equation volume element in cylindrical coordinate system. [10]
b) A metallic plate, 3 cm thick is maintained at 400°C on one side and 100°C on the other. How much heat is transferred through the plate? ($k=370\text{W/mK}$). [5]
- 2 a) Derive an expression for the heat flow rate through a hollow sphere of ID d_1 and OD d_2 whose internal and external surfaces are maintained at temperatures T_1 and T_2 respectively. The thermal conductivity varies linearly with temperature from k_1 at T_1 to k_2 at T_2 . [8]
b) A very long 1 cm diameter copper rod $k=377\text{W/mK}$ is exposed to an environment at 22°C . The base temperature of the rod is maintained at 150°C . The heat transfer coefficient between the rod and the surrounding air is $11\text{W/m}^2\text{K}$. Estimate the heat transfer rate from the rod to the surrounding air. [7]
- 3 a) Define thermal diffusivity. Explain its significance in terms of penetration depth for a semi-infinite body. [5]
b) A metallic rod 12.5 mm diameter at 90°C is cooled to 35°C in 105 s by placing it in air stream at 30°C . Calculate the heat transfer coefficient, h , for air. [10]
For rod: Mass=0.1 kg, $c=350\text{J/kg}$, surface area $A=0.04\text{m}^2$.
- 4 Using dimensional analysis, obtain the general form of equation for natural convective heat transfer. [15]
- 5 a) What is Dittus-Boelter equation? Where and when does it apply? [5]
b) Air at a temperature of 27°C is moving at a velocity of 0.3 m/s past a 40W incandescent bulb. The bulb may be treated as sphere of 50 mm diameter with its surface at a temperature of 127°C . Estimate the heat transfer coefficient and compute the percentage of power loss due to convection. [10]
- 6 a) Sketch the film wise condensation on a vertical wall showing film thickness, velocity and temperature profiles. [5]
b) Water at atmospheric pressure is boiled in a kettle made of copper. The bottom of the kettle is flat, 30 cm in diameter and is maintained at a temperature of 118°C . Calculate the rate of heat required to boil water. Also estimate the rate of evaporation of water from the kettle. [10]

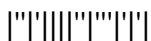


Code No: **R32033**

R10

Set No. 1

- 7 a) Discuss the advantages of NTU method over the LMTD method of heat exchanger design. [5]
- b) Hot coil having a specific heat of 2.09 kJ/kgK flows through a counter flow heat exchanger at the rate of 2268 kg/h with an inlet temperature of 93°C and an outlet temperature of 65°C . Cold oil having a specific heat of 1.67 kJ/kg K flows in at a rate of 3600 kg/h and leaves at 149°C . What area is required to handle this load if the overall heat transfer coefficient based on the inside area is $0.7 \text{ kW/m}^2\text{K}$. [10]
- 8 a) State the Planck's law. Write down the expression for the radiation intensity. [7]
- b) Two parallel plates $3 \text{ m} \times 2 \text{ m}$, placed 1 m apart, are maintained at 500°C and 200°C , their respective emissivities being 0.3 and 0.5 . If the temperature of the room in which these plates are located is 40°C , estimate the heat lost by the hotter plate. Consider radiation only. [8]



Code No: **R32053**

R10

Set No. 1

III B.Tech II Semester Supplementary Examinations, April - 2016
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE and IT)

Time: 3 hours

Max. Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

- 1 Explain the following Asymptotic Notations:
 - (a) Big oh notation.
 - (b) Omega notation.
 - (c) Theta notation.
 - (d) Little oh notation.
 - (e) Probabilistic analysis

- 2 a) What is weighting rule for Union (i, j)? How it improves the performance of union operation? Explain with example.
b) What is biconnected graph? How to determine biconnected components of graph?
c) Define Articulation point. Illustrate with an example.

- 3 a) Explain about Binary search operation with an example.
b) Discuss the Strassen's matrix multiplication concept with an example. Derive it's time complexity.

- 4 a) Define the terms feasible solution, optimal solution and objective function.
b) Explain the Knapsack problem. Find an optimal solution to the Knapsack instance $n=7$, $m=15$, $(p_1, p_2, p_3, \dots, p_7)=(10,5,15,7,6,18,3)$ and $(w_1, w_2, w_3, \dots, w_7)=(2, 3, 5,7, 1, 4, 1)$.

- 5 a) Define OBST. How will you construct an optimal binary search tree?
b) Use function OBST to compute $w(i,j), r(i,j)$ and $c(i,j)$, $0 \leq i < j \leq 4$, for the identifier set $(a_1, a_2, a_3, a_4)=(\text{count, float, if, while})$ with $p(1)=1/20$, $p(2)=1/5$, $p(3)=1/10$, $p(4)=1/20$, $q(0)=1/5$, $q(1)=1/10$, $q(2)=1/5$, $q(3)=1/20$, and $q(4)=1/20$.
Using the $r(i,j)$'s, construct the Optimal Binary Search Tree.

- 6 a) What is Back Tracking? Explain the general method of Back Tracking.
b) Briefly explain sum of subsets problem using backtracking. Explain its applications.

- 7 a) Explain the principles of Control Abstractions for LC-search.
b) Give the principles of FIFO Branch & Bound.

- 8 a) Explain the P, NP, NP-Hard and NP- complete classes with suitable examples.
b) Write about tractable and intractable problems.



Code No:V3218

R07

Set No. 1

III B.Tech II Semester Supplementary Examinations, April - 2016

DIGITAL SIGNAL PROCESSING

(Common to EEE, ECE, EIE)

Time: 3 hours

Max. Marks:80

Answer any FIVE Questions
All Questions carry equal marks

- 1 a) Find the convolution of the two finite-length sequences: [8]
 $x(n) = (0.9)^n u(n)$
 $h(n) = nu(n)$
 $x_1(n) = 2^n u(-n)$
 $x_2(n) = u(n)$
- b) What is the frequency response of a discrete LTI system. Derive the frequency response of a system whose impulse response is given by $h(n) = a^n U(n-1)$ for $|a| < 1$. [8]
- 2 a) State and prove time and frequency shifting properties of Fourier transform? [6]
- b) Compute the discrete Fourier transform of each of the following finite length sequences [9]
(a) $x_1(n) = \left(\frac{1}{2}\right)^n u(n+3)$
(b) $x_2(n) = \alpha^n \sin(n\omega_0) u(n)$
(c) $x_3(n) = \begin{cases} \left(\frac{1}{2}\right)^n & n = 0, 2, 4, \dots \\ 0 & \text{otherwise} \end{cases}$
- 3 a) Draw a 8 - point radix - 2 FFT DIT flow graph and obtain DFT of the following sequence $x(n) = (0, 1, -1, 0, 0, 2 - 2, 0)$ [8]
- b) Discuss the FFT algorithm using decimation in time technique. [8]
- 4 a) Find out the Z-transform for the following discrete time sequence $x(n) = kn, n \geq 0$. [8]
- b) Explain how the analysis of discrete time invariant system can be obtained by using convolution properties of the Z- Transform? [8]
- 5 a) Convert the analog filter with system function $H_a(s) = \frac{(s+0.1)}{(s+0.1)^2 + 16}$ into a digital IIR filter by means of the bilinear transformation. The digital filter is to have a resonant frequency of $\omega_r = \frac{\pi}{2}$. [8]
- b) Compare the characteristics of Butterworth and Chebyshev Filters. [8]
- 6 a) Write the magnitude and phase function of FIR filter when [8]
i) impulse response is symmetric and N is odd
ii) impulse response is symmetric and N is even
- b) Explain designing of FIR filter using frequency sampling technique. [8]



Code No: V3218

R07

Set No. 1

- 7 a) Design one stage and two stage interpolators to meet the following specification: [16]
- $I = 20$
- Passband: $0 \leq F \leq 90$
- Transband: $90 \leq F \leq 100$
- Sampling rate: 10,000Hz
- Ripple: $\delta_1 = 10^{-2}, \delta_2 = 10^{-3}$
- 8 a) Explain about the addressing modes in the DSP processors. [8]
- b) What are the advantages of CISC ? [8]

