

III B. Tech I Semester Regular Examinations, November- 2015
GEOTECHNICAL ENGINEERING – I
 (Civil Engineering)

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 different types of soil structures with neat figures. [3M]
- b) What is a flow curve? Explain with a neat sketch. [4M]
- c) What are the factors affecting permeability? [4M]
- d) What are differences between Bossiness's and Westergaard's theories? [4M]
- e) Define over consolidated, under consolidated and normally consolidated clays. [3M]
- f) Explain the basic mechanism of shear strength of soils. [4M]

PART -B

- 2 a) What is compaction and how it is different from consolidation? [4M]
- b) Explain in detail about three clay minerals. [8M]
- c) One cubic metre of wet soil weighs 19.80 kN. If the specific gravity of soil particles is 2.70 and water content is 11%, find the void ratio, dry density and degree of saturation. [4M]
- 3 a) Define three consistency limits. [3M]
- b) Explain IS soil classification. [8M]
- c) What are the different hydrometer corrections? Explain. [5M]
- 4 a) Derive expression for calculating average permeability of layered soil systems. [8M]
- b) What are the uses of flow nets? [4M]
- c) In order to compute the seepage loss through the foundation of a cofferdam, flownets were constructed. The result of the flownet study gave $N_f = 6$, $N_d = 16$. The head of water lost during seepage was 19.68m. If the hydraulic conductivity of the soil is $k = 13.12 \times 10^{-5}$ m/s, compute the seepage loss per metre length of dam per day. [4M]
- 5 a) Explain Newmark's influence chart preparation and usage. [8M]
- b) Explain 2:1 stress distribution method. [3M]
- c) A ring footing of external diameter 8 m and internal diameter 4 m rests at a depth 2 m below the ground surface. It carries a load intensity 150 kN/m^2 . Find the vertical stress at depths of 2, 4 and 8 m along the axis of the footing below the footing base. Neglect the effect of the excavation on the stress. [5M]



- 6 a) Explain concept of consolidation using Spring Analogy. [5M]
b) Explain the procedure for determining pre consolidated pressure. [5M]
c) An oedometer test is performed on a 2 cm thick clay sample. After 5 minutes, 50% consolidation is reached. After how long time would the same degree of consolidation is achieved in the field where the clay layer is 3.70 m thick? Assume the sample and the clay layers have the same drainage boundary conditions (double drainage). [6M]
- 7 a) Explain Mohr Coulomb's shear failure theory. [4M]
b) Explain three drainage conditions for conducting shear testing of soils. [4M]
c) Given the following data from a consolidated undrained test with pore water pressure measurement, determine the total and effective stress parameters: [8M]
- | | | |
|-------------------------|-----------------------|-------------------------|
| σ_3 | 100 kN/m ² | 200 kN/m ² |
| $(\sigma_1 - \sigma_3)$ | 150 kN/m ² | 192 kN/m ² |
| uf | 60 kN/m ² | 140 kN/m ² . |

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GEOTECHNICAL ENGINEERING – I

(Civil Engineering)

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PART -A

- | | | | |
|---|----|---|------|
| 1 | a) | What are the effects of compaction on soil properties? | [3M] |
| | b) | Explain with neat figure about plasticity chart and label it clearly. | [4M] |
| | c) | What quick sand condition? | [4M] |
| | d) | What is the use of New mark's influence chart? | [3M] |
| | e) | Define initial, primary and secondary consolidation of soils. | [4M] |
| | f) | How soils attain their shear strength? | [4M] |

PART -B

- | | | | |
|---|----|---|------|
| 2 | a) | What is compactive effort? | [4M] |
| | b) | Write a relationship between void ratio, degree of saturation, unit weight of soil, unit weight of water and specific gravity of soil solids. | [6M] |
| | c) | The soil in a borrow pit has a void ratio of 0.90. A fill-in-place volume of 20,000 m ³ is to be constructed with an in-place dry density 18.84 kN/m ³ . If the owner of borrow area is to be compensated at Rs. 1.50 per cubic metre of the excavation, determine the cost of compensation. | [6M] |
| 3 | a) | Draw a grain size distribution curves for different grades of soils and name them. | [6M] |
| | b) | What are the different Atterberg limits? Explain them. | [6M] |
| | c) | The natural moisture content of an excavated soil is 32%. Its liquid limit is 60% and plastic limit is 27%. Determine the plasticity index of the soil and comment about the nature of the soil. | [4M] |
| 4 | a) | Derive an equation, for determining soil permeability using variable head permeability test. | [8M] |
| | b) | A concrete dam is constructed across a river over a permeable stratum of soil of limited thickness. The water heads are upstream side 16m and 2m on the downstream side. The flow net constructed under the dam gives Nf= 4 and Nd=12. Calculate the seepage loss through the subsoil if the average value of the hydraulic conductivity is 6×10^{-3} cm/sec horizontally and 3×10^{-4} cm/ sec vertically. Calculate the exit gradient if the average length of the last field is 0.9 m. Assuming $e = 0.56$, and $G_s = 2.65$, determine the critical gradient. Comment on the stability of the river bed on the downstream side. | [8M] |



- 5 a) Derive an equation for determining the stress intensity at a given on the axis of loading due to the uniformly loaded circular area. [8M]
 b) What is an isobar? What is a pressure bulb? [3M]
 c) A ring footing of external diameter 8 m and internal diameter 4 m rests at a depth 2 m below the ground surface. It carries a load intensity 200 kN/m^2 . Find the vertical stress at depths of 2, 4 and 8 m along the axis of the footing below the footing base. Neglect the effect of the excavation on the stress. [5M]
- 6 a) Explain coefficient of volume compressibility, coefficient of consolidation. [6M]
 b) How do you determine the consolidated settlement of a foundation? [4M]
 c) An oedometer test is performed on a 4 cm thick clay sample. After 5 minutes, 50% consolidation is reached. After how long a time would the same degree of consolidation is achieved in the field where the clay layer is 8 m thick? Assume the sample and the clay layer has the same drainage boundary conditions (double drainage). [6M]
- 7 a) Explain the limitations of shear box test. [4M]
 b) Name different lab shear tests on soils. [4M]
 c) Given the following data from a consolidated undrained test with pore water pressure measurement, determine the total and effective stress parameters: [8M]
- | | | |
|-------------------------|----------------------|----------------------|
| σ_3 | 100 kN/m^2 | 200 kN/m^2 |
| $(\sigma_1 - \sigma_3)$ | 157 kN/m^2 | 199 kN/m^2 |
| u_f | 57 kN/m^2 | 136 kN/m^2 |

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PART -A

- 1 a) What is compaction control? Explain. [4M]
- b) Explain C_u , C_c . [4M]
- c) What is Capillarity? Derive an equation to find its rise in soils. [4M]
- d) What is the use of New mark's influence chart? [3M]
- e) What is degree of consolidation and what is it's relation with time factor? [3M]
- f) Explain different drainage conditions for shear testing of soils. [4M]

PART -B

- 2 a) Explain the difference between IS light and heavy compactions. [6M]
- b) Write a relationship between water content, void ration, degree of saturation and specific gravity of soil solids. [4M]
- c) A dry soil has a void ratio of 0.65 and its grain specific gravity is = 2.80. [6M]
 - (i) What is its unit weight?
 - (ii) Water is added to the sample so that its degree of saturation is 60% without any change in void ratio. Determine the water content and unit weight.
 - (iii) The sample is next placed below water. Determine the true unit weight (not considering buoyancy) if the degree of saturation is 95% and 100% respectively.
- 3 a) Show IS soil classification based on grain size. [4M]
- b) Explain Total, neutral and effective stresses. [6M]
- c) The laboratory tests on a sample of soil gave the following results: [6M]
 $w_n = 24\%$, $w = 62\%$, $w_p = 28\%$, percentage of particles less than 2 microns is- 23%. Determine: (i) The liquidity index, (ii) activity, (iii) consistency and nature of soil.
- 4 a) Derive an equation for quicksand condition. [6M]
- b) Explain Total, Neutral and Effective Stresses. [6M]
- c) In order to compute the seepage loss through the foundation of a cofferdam, flownets were constructed. The result of the flownet study gave $N = 6$, $Nd = 16$. The head of water lost during seepage was 19.68m. If the hydraulic conductivity of the soil is $k = 13.12 \times 10^{-5}$ m/s, compute the seepage loss per metre length of dam per day. [4M]



- 5 a) Explain New mark's influence chart preparation and usage. [8M]
b) What is an isobar? What is a pressure bulb? [3M]
c) A ring footing of external diameter 8 m and internal diameter 4 m rests at a depth 2 m below the ground surface. It carries a load intensity 250 kN/m^2 . Find the vertical stress at depths of 2, 4 and 8 m along the axis of the footing below the footing base. Neglect the effect of the excavation on the stress. [5M]
- 6 a) What are the assumptions in Terzaghi's 1-D Consolidation theory? [6M]
b) Explain consolidation concept. [4M]
c) An oedometer test is performed on a 3 cm thick clay sample. After 5 minutes, 50% consolidation is reached. After how long a time would the same degree of consolidation is achieved in the field where the clay layer is 6 m thick? Assume the sample and the clay layers have the same drainage boundary conditions (double drainage). [6M]
- 7 a) How soils attain their shear strength? [4M]
b) Explain soil strength envelop. [4M]
c) Given the following data from a consolidated undrained test with pore water pressure measurement, determine the total and effective stress parameters: [8M]
- | | | |
|-------------------------|----------------------|----------------------|
| σ_3 | 99 kN/m^2 | 201 kN/m^2 |
| $(\sigma_1 - \sigma_3)$ | 155 kN/m^2 | 197 kN/m^2 |
| uf | 58 kN/m^2 | 138 kN/m^2 |

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 3. Answer any **THREE** Questions from **Part-B**

PART –A

- 1 a) What are factors that affect compaction? [4M]
- b) Explain C_u, C_c . [4M]
- c) What is quick sand condition? [3M]
- d) What is 2:1 stress distribution method? [4M]
- e) Define coefficient of consolidation and give its relations with other soil parameters. [3M]
- f) Explain different drainage conditions for shear testing of soils. [4M]

PART -B

- 2 a) What are various field compaction methods? [4M]
- b) Write a relationship between void ratio, degree of saturation, unit weight of soil, unit weight of water and specific gravity of soil solids. [6M]
- c) A soil has bulk density of 20.1 kN/m^3 and water content of 15%. Calculate the water content if the soil partially dries to a density of 19.4 kN/m^3 and the void ratio remains unchanged. [6M]
- 3 a) Draw a grain size distribution curves for different grades of soils and name them. [5M]
- b) What are the corrections required in hydrometer analysis? [5M]
- c) The laboratory tests on a sample of soil gave the following results: [6M]
 $w_n = 24\%$, $w_p = 62\%$, $w_L = 28\%$, percentage of particles less than 2 microns is-23%. Determine: (i) The liquidity index, (ii) activity (iii) consistency and nature of soil.
- 4 a) What is capillarity? Derive an equation to find its rise in soils. [4M]
- b) Explain Flow nets, their Characteristics and Uses. [6M]
- c) A concrete dam is constructed across a river over a permeable stratum of soil of limited thickness. The water heads are upstream side 16m and 2 m on the downstream side. The flow net constructed under the dam gives $N_f = 4$ and $N_d = 12$. Calculate the seepage loss through the subsoil if the average value of the hydraulic conductivity is $6 \times 10^{-3} \text{ cm/sec}$ horizontally and $3 \times 10^{-4} \text{ cm/sec}$ vertically. Calculate the exit gradient if the average length of the last field is 0.9 m. Assuming $e = 0.56$, and $G = 2.65$. [6M]



- 5 a) Explain Newmark's influence chart. [8M]
 b) What is an isobar? What is a pressure bulb? [3M]
 c) A ring footing of external diameter 8 m and internal diameter 4 m rests at a depth 2 m below the ground surface. It carries a load intensity 300 kN/m^2 . Find the vertical stress at depths of 2, 4 and 8 m along the axis of the footing below the footing base. Neglect the effect of the excavation on the stress. [5M]
- 6 a) Explain Compression Index and Swelling Index. [6M]
 b) How do you determine the consolidation settlement of a foundation [4M]
 c) An oedometer test is performed on a 3 cm thick clay sample. After 5 minutes, 50% consolidation is reached. After how long a time would the same degree of consolidation is achieved in the field where the clay layer is 5 m thick? Assume the sample and the clay layers have the same drainage boundary conditions (double drainage). [6M]
- 7 a) Explain shear box test with neat figure. [8M]
 b) Given the following data from a consolidated undrained test with pore water pressure measurement, determine the total and effective stress parameters: [8M]
- | | | |
|-------------------------|----------------------|----------------------|
| σ_3 | 100 kN/m^2 | 200 kN/m^2 |
| $(\sigma_1 - \sigma_3)$ | 156 kN/m^2 | 198 kN/m^2 |
| uf | 58 kN/m^2 | 138 kN/m^2 |

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III B. Tech I Semester Regular Examinations, November - 2015
ELECTRICAL MEASUREMENTS
 (Electrical and Electronics Engineering)

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 the essential features of Indicating Instruments. [4M]
- b) What do you understand by Phantom or Fictitious loading in energy meters and why is it necessary? [4M]
- c) List out the limitations of AC potentiometers. [3M]
- d) How are detectors classified? Explain each one of them briefly. [4M]
- e) Explain briefly about Permeameters. [3M]
- f) Define resolution and Sensitivity of Digital voltmeter. [4M]

PART -B

- 2 a) Derive the torque equation of a moving iron instrument and further comment up on the nature of scale. [8M]
- b) The primary winding of a 1200/6A, 50 Hz current transformer has a single turn. Its secondary burden consists of a non – inductor impedance of 1.6Ω . If the iron loss in the core is 1.6 W at full load and magnetizing mmf is 80 AT, calculate the i) flux in the core, ii) Ratio error at full load. Neglect leakage reactance. [8M]
- 3 a) Explain the working of Dynamometer type single phase power factor meter with a neat diagram. [8M]
- b) Explain the different sources of errors in Induction type Energy meter and how they can be adjusted/compensated. [8M]
- 4 a) Explain the working of a polar type potentiometer with a neat diagram. [8M]
- b) Explain how the Resistance and current can be measured using a D.C Potentiometer. [8M]
- 5 a) Explain any one method for the measurement of high resistance and explain its advantages over other methods. [10M]
- b) List the null/balance detectors that are commonly used for A.C. bridges and explain them briefly. [6M]
- 6 Explain with a schematic diagram for the determination of Hysteresis loop by method of reversals. [16M]
- 7 a) Explain the working of Linear Ramp type Digital voltmeter with a neat schematic. [8M]
- b) Explain about Lissajous patterns in Cathode Ray Oscilloscope. [8M]



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PART -A

- | | | |
|---|--|------|
| 1 | a) Explain about Spring control and gravity control controlling devices. | [4M] |
| | b) What do you mean by Creeping error in Induction Energy meter and how it can be adjusted? | [4M] |
| | c) Explain the procedure for standardizing the potentiometer. | [4M] |
| | d) State the applications of Wein bridge. | [3M] |
| | e) Define the following terms related to magnetic materials:
i)Magnetic field strength ii) Curie temperature. | [4M] |
| | f) Compare between Analog and Digital Instruments. | [3M] |

PART -B

- | | | |
|---|---|-------|
| 2 | a) Explain the working of Moving iron Attraction type of Instrument with a neat diagram. | [8M] |
| | b) Derive the expressions for the ratio and phase angle errors of a current transformer with a neat phasor diagram. | [8M] |
| 3 | a) Explain the working of Induction type single phase Energy meter with a neat diagram. | [8M] |
| | b) A 50 A, 230V meter on full load test makes 61 revolutions in 37 seconds. If the normal disc speed is 520 revolutions per KWH, find the percentage error. | [8M] |
| 4 | a) How does an AC potentiometer different from a DC Potentiometer. | [6M] |
| | b) Explain how the calibration of Voltmeter and Wattmeter can be done using a DC Potentiometer. | [10M] |
| 5 | a) Explain the procedure for measurement of medium resistance using Carey – Foster slide – wire bridge method and derive the necessary equation. | [10M] |
| | b) Deduce the general equation or condition for bridge balance in AC Circuits. | [6M] |
| 6 | a) Explain the operation of Ballistic Galvanometer with a neat diagram. | [8M] |
| | b) Explain the AC bridge method for measurement of iron losses in ferromagnetic materials. | [8M] |
| 7 | a) Explain the working of Successive Approximation type Digital Voltmeter with a neat diagram. | [8M] |
| | b) Explain the working of Digital Tachometer with a neat block diagram. | [8M] |



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PART -A

- | | | |
|---|--|------|
| 1 | a) Explain the significance of Eddy current damping in an indicating Instrument. | [3M] |
| | b) Distinguish between the balanced and unbalanced loads. | [4M] |
| | c) Explain the significance of a Potentiometer. | [3M] |
| | d) Discuss the common sources of error in AC bridges. How are they eliminated? | [4M] |
| | e) How are magnetic materials classified? | [4M] |
| | f) List out the advantages of Digital Voltmeters. | [4M] |

PART -B

- | | | |
|---|---|-------|
| 2 | a) Derive the equation for deflection of a Dynamometer type of instruments which can be used for both DC and AC. | [8M] |
| | b) What are the advantages of Instrument transformers over Ammeter shunts and Voltmeter multipliers? | [8M] |
| 3 | a) Explain with a neat circuit of Dynamometer type Wattmeter and derive the equation for deflection. | [10M] |
| | b) List the various types of errors in dynamometer type Wattmeter's. | [6M] |
| 4 | a) Explain the working of Crompton Potentiometer with a neat diagram. | [8M] |
| | b) Explain the standardization procedure for the AC Potentiometer. Explain how AC Potentiometer can be used for the measurement of self inductance of a coil. | [8M] |
| 5 | a) Explain with a neat diagram for the measurement of Inductance using Hay bridge and also derive the relation for inductance under balanced condition using a neat phasor diagram. | [10M] |
| | b) Explain the Dissipation factor of a lossy dielectric. How can it be measured? | [6M] |
| 6 | Explain the construction and working of Grassot flux meter with a neat diagram and also prove that "the change in the value of flux is directly proportional to the change in deflection" in this case. | [16M] |
| 7 | a) Explain the working of Dual slope Integrating type Digital Voltmeter with a neat schematic diagram. | [8M] |
| | b) Explain the working of Digital frequency meter with a neat block diagram. | [8M] |



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PART -A

- | | | |
|---|---|------|
| 1 | a) Define the following terms related to Instrument transformers
i)Transformation ratio ii)Turns Ratio | [4M] |
| | b) Define LPF and UPF wattmeter's and give their significance. | [4M] |
| | c) What are the applications of self balancing Potentiometers? | [3M] |
| | d) From the point of measurement, how can resistances be classified. | [4M] |
| | e) List the precautions needed to be taken in Magnetic testing. | [4M] |
| | f) Explain the basic block diagram of a Digital voltmeter. | [3M] |

PART -B

- | | | |
|---|--|-------|
| 2 | a) Explain with a neat diagram the Quadrant type of Electrostatic Instrument. | [8M] |
| | b) A moving coil milli ammeter having a resistance of 10Ω gives full scale deflection when a current of 5 mA is passed through it. Explain how this instrument can be used for measurement of i) Current up to 1A, ii) Voltage up to 5 V. | [8M] |
| 3 | a) Explain how a power measurement range can be extended with a wattmeter in conjunction with an instrument transformer. | [8M] |
| | b) A single phase KWh meter makes 500 revolutions per KWh. It is found, on testing, as making 40 revolutions in 58 seconds at 5 KW full load. Find out the percentage error. | [8M] |
| 4 | a) Explain the working of Gall Co-ordinate type Potentiometer with a neat diagram. | [10M] |
| | b) Explain how the Voltage and power can be measured using a dc Potentiometer. | [6M] |
| 5 | a) Explain the procedure of measuring a low resistance with the help of Kelvin's double bridge. Derive the necessary relation for finding the unknown resistance under balanced condition of the bridge. | [10M] |
| | b) Explain the importance of Wagner's earthing device. | [6M] |
| 6 | a) Explain the AC Potentiometer method for measurement of iron losses in ferromagnetic materials. | [8M] |
| | b) Give the merits and demerits of ring and bar specimens that are commonly used in magnetic testing of materials. | [8M] |
| 7 | a) List the general specifications of Digital Voltmeters. | [8M] |
| | b) Explain the basic scheme of Digital multimeter along with its advantages. | [8M] |



III B. Tech I Semester Regular Examinations, November - 2015
DYNAMICS OF MACHINERY
 (Common to ME and AME)

Time: 3 hours

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PART -A

- | | | |
|---|---|------|
| 1 | a) What is gyroscopic torque? | [4M] |
| | b) What is meant by expression friction circle? | [4M] |
| | c) What is meant by turning moment diagram or crank effort diagram? | [4M] |
| | d) What is the function of governor? | [4M] |
| | e) What is meant by balancing of rotating masses? | [3M] |
| | f) What are the causes and effect of vibration? | [3M] |

PART -B

- 2 The turbine rotor of a ship has a mass of 20 tones and a radius of gyration 0.75. Its speed is 2000 rpm. The ship pitches 6° above and below the horizontal position .One complete oscillation takes 18 seconds and the motion is simple harmonic. Determine [16M]
- (i) the maximum couple tending to shear the holding down bolt of the turbine
- (ii) The maximum angular acceleration of the ship during pitching. The direction in which the bow will tend to turn while, if the rotation of the rotor is clockwise when looking from rear.
- 3 a) Which of the two assumptions-uniform intensity of pressure or uniform rate of wear, would you make use of in designing friction clutch and why? [8M]
- b) A cone clutch with cone angle 20° is to transmit 7.5 kW at 750 rpm. The normal intensity of pressure between the contact faces is not to exceed 0.12N/mm^2 . The coefficient of friction is 0.2. If face width is $1/5^{\text{th}}$ of mean diameter, find: [8M]
- (i) The main dimensions of the clutch and
- (ii) Axial force required while running.
- 4 The turning moment diagram for a four stroke gas engine may be assumed for simplicity to be represented by four triangles, the areas of which from the line of zero pressure are as follows: Expansion stroke = 3550 mm^2 ; Exhaust stroke = 500 mm^2 ; Suction stroke = 350 mm^2 ; and compression stroke = 1400 mm^2 . each mm^2 represents 3 N-m. Assuming the resisting moment to be uniform, find the mass of the rim of a fly wheel required to keep the mean speed 200 rpm within $\pm 2\%$. The mean radius of the rim may be taken as 0.75 m. Also determine the crank positions for the maximum and minimum speeds. [16M]



- 5 The lengths of the upper and lower arms of a porter governor are 200mm and 250mm respectively. Both the arms are pivoted on the axis of rotation. The central load is 150N, the weight of the each ball is 20N and the friction of the sleeve together with the resistance of the operating gear is equivalent to a force of 30N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40° taking friction in to account. Find the range of speed of the governor. [16M]
- 6 Four masses M_1 , M_2 , M_3 and M_4 are 200kg, 300kg, 240kg and 260kg respectively. The corresponding radii of rotation are 0.2m, 0.15m, 0.25m and 0.3m respectively and the angle between successive masses are 45° , 75° and 135° . Find the position and magnitude of balance mass required if its radius of rotation is 0.25m. [16M]
- 7 In a single degree of damped vibration system a suspended mass of 8kg makes 30 oscillations in 18 seconds. The amplitude decreases in 18 seconds. The amplitude decreases to 0.25 of the initial value after 5 oscillations. Determine
- (i) the spring stiffness
 - (ii) logarithmic decrement
 - (iii) damping factor
 - (iv) Damping coefficient.

(4M+4M+4M+4M)

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PART -A

- | | | |
|---|--|------|
| 1 | a) What is the effect of gyroscopic couple on rolling of ship? Why? | [4M] |
| | b) What is friction? Is it a blessing or curse? Justify your answer giving examples? | [4M] |
| | c) Why flywheels are needed in forging and pressing operations? | [4M] |
| | d) How governors are classified? | [4M] |
| | e) Why rotating masses are to be dynamically balanced? | [3M] |
| | f) Define frequency, cycle, period and free vibration. | [3M] |

PART -B

- | | | |
|---|---|--------------|
| 2 | The rotor of a turbine yacht rotates at 1200rpm clockwise when viewed from stern. The rotor has a mass of 750 kg and radius of gyration of 250mm. Find the maximum gyroscopic couple transmitted to the hull when yacht pitches with a maximum angular velocity of 1 rad/s. What is the effect of this couple? | [16M] |
| 3 | A band and block brake having 12 blocks, each of which subtends an angle of 160 at the centre, is applied to a rotating drum of diameter 600 mm. the blocks are 75 mm thick. The drum and the flywheel mounted on the same shaft have a mass of 1800kg and have a combined radius of gyration of 600mm. the two ends of the band are attached to pins on the opposite sides of the brake fulcrum at distance of 40 mm and 150mm from the fulcrum. If a force of 250 N is applied at a distance of 900 mm from the fulcrum, find (i) the maximum braking torque (ii) the angular retardation of the drum (iii) the time taken by the system to be stationary from the rated speed of 300 rpm. Take coefficient of friction between the blocks and the drum as 0.3. | [16M] |
| 4 | Derive expression for
(a) Coefficient of steadiness
(b) Energy stored in flywheel. | [8M]
[8M] |
| 5 | A porter governor has equal arms each 250mm long and pivoted on the axis of rotation. Each ball has a mass of 5kg and mass of the central load on the sleeve is 25kg. The radius of rotation of the ball is 150mm when governor is at maximum speed. Find the maximum and minimum speed and range of speed of the governor | [16M] |
| 6 | Four masses A, B, C and D revolves at equal radii and equally spaced along a shaft. The mass B is 7kg and the radii of C and D make angle s of 90° and 240° respectively with the radius of B. Find the Magnitude of masses A, C and D and angular position of A, so that the system may be completely balanced. | [16M] |
| 7 | Derive an expression for the natural frequency of the free longitudinal vibration by
(i) Equilibrium method, (ii) Energy method, (iii) Rayleigh's method. | [16M] |

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III B. Tech I Semester Regular Examinations, November - 2015
DYNAMICS OF MACHINERY
(Common to ME and AME)

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) Define gyroscopic couple | [4M] |
| | b) Explain the terms: friction circle and friction axis | [4M] |
| | c) Differentiate the function of flywheel and governor | [4M] |
| | d) Differentiate between governor and fly wheel | [4M] |
| | e) Define static balancing. | [3M] |
| | f) What are the different types of vibrations? | [3M] |

PART -B

- | | | |
|---|---|-------|
| 2 | Each paddle wheel of a steamer has a mass of 1600kg and a radius of gyration of 1.2m. The steamer turns to port in a circle of 160m radius at 24Km/hr. The speed of the paddle is 90 rpm. Find the magnitude and effect of the gyroscopic couple acting on the steamer. | [16M] |
| 3 | a) Describe with a neat sketch the working of a single plate friction clutch. | [8M] |
| | b) Establish a formula for the maximum torque transmitted by a single plate clutch of external and internal radii r_1 and r_2 , if the limiting coefficient of friction is μ and the axial spring load is W . Assume that the pressure intensity on the contact faces is uniform. | [8M] |
| 4 | a) What is meant by piston effort and crank effort? | [8M] |
| | b) The crank of a three-cylinder single-acting engine is set equally at 120° the engine speed is 540 rpm. The turning-moment diagram for each cylinder is a triangle for the power stroke with a maximum torque of 100 N-m at 60° after dead- centre of the corresponding crank. On the return stroke, the torque is sensibly zero. Determine | [8M] |
| | (i) The power developed | |
| | (ii) The coefficient of fluctuation of speed if the flywheel has a mass of 7.5 kg with a radius of gyration of 65 mm | |
| | (iii) The coefficient of fluctuation of energy and | |
| | (iv) The maximum angular acceleration of the fly wheel. | |
| 5 | A hartnell governor having a central sleeve spring and two right angled bell crank lever operates between 290rpm and 310rpm for a sleeve lift of 15mm. The sleeve and ball arms are 80mm and 120mm respectively. The levers are pivoted at 120mm from the governor axis and mass of the ball is 2.5kg. The ball arms are parallel at lowest equilibrium speed. Determine (i) load on the spring at maximum and minimum speeds and (ii) Stiffness of the spring. | [16M] |



- 6 Derive the following expression of effects of partial balancing in two cylinder locomotive engine (i) Variation of tractive force, (ii) Swaying couple and (iii) Hammer blow. [16M]
- 7 a) A cantilever shaft 50mm diameter and 300mm long has a disc of mass 100kg at its free end. The Young's modulus for the shaft material is 200GN/m^2 . Determine the frequency of longitudinal and transverse vibration of the shaft. [8M]
- b) Explain, with sketches the different cases of damped vibrations. [8M]

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III B. Tech I Semester Regular Examinations, November - 2015
DYNAMICS OF MACHINERY
 (Common to ME and AME)

Time: 3 hours

Max. Marks: 70

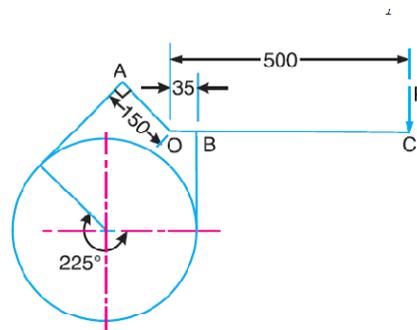
- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answering the question in **Part-A** is compulsory
 3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) Write expression for gyroscopic couple. [4M]
- b) What is meant by uniform pressure theory or uniform wear theory for the friction torque of a bearing? [4M]
- c) List out the few machines in which flywheel are used. [4M]
- d) What is meant by sensitiveness of a governor? [4M]
- e) Define dynamic balancing [3M]
- f) State different methods of finding natural frequency of a system. [3M]

PART -B

- 2 a) Explain the effect of Gyroscopic couple on a Naval ship during pitching. [8M]
- b) Explain the effect of Gyroscopic couple on a Aeroplane. [8M]
- 3 a) A truncated conical pivot of cone angle ϕ rotating at speed N supports a load W. The smallest and largest diameter of pivot over the contact area 'd' and 'D' respectively. Assuming uniform wear, derive the expression for frictional torque. [8M]
- b) A differential band brake, as shown in figure, below has an angle of contact of 225° . The band has a compressed woven lining and bears against a cast iron drum of 350 mm diameter. The brake is to sustain a torque of 350 N-m and the coefficient of friction between the band and the drum is 0.3. Find i) The necessary force (P) for the clockwise and anticlockwise rotation of the drum; and ii) The value of 'OA' for the brake to be self locking, when the drum rotates clockwise. [8M]



All dimensions in mm.



- 4 What is the function of a flywheel? How does it differ from that of a governor? [16M]
The torque delivered by a two –stroke engine is represented by $t = (1000 + 300 \sin 2\phi - 500 \cos 2\phi)$ N. m where ϕ is the angle turned by the crank from the inner-dead centre. The engine speed is 250 rpm. The mass of the flywheel is 400 kg and radius of gyration is 400 mm. Determine (i) The power developed (ii) The total percentage fluctuation of speed (iii) The angular acceleration of flywheel when the crank has rotated through an angle of 60° from the inner-dead centre and (iv) The maximum angular acceleration and retardation of the flywheel.
- 5 Calculate the rage of speed of a porter governor which has equal arms of each 200mm long and pivoted on the axis of rotation. The mass of each ball is 4kg and the central load of the sleeve is 20kg. The radius of rotation of the ball is 100mm when the governor being to lift and 130mm when the governor is at maximum speed. [16M]
- 6 The data for three rotating masses are given below: [16M]
 $M_1 = 4\text{kg}$ $r_1 = 75\text{mm}$ $\theta_1 = 45^\circ$
 $M_2 = 3\text{kg}$ $r_2 = 85\text{mm}$ $\theta_2 = 135^\circ$
 $M_3 = 2.5\text{kg}$ $r_3 = 50\text{mm}$ $\theta_3 = 240^\circ$
Determine the amount of counter mass at a radial distance of 65mm required for their static balance.
- 7 A steel shaft 100mm in diameter is loaded and support in shaft bearing 0.4m apart. The shaft carries three loads: first mass 12kg at the centre, second mass 10kg at a distance 0.12m from the left bearing and third mass of 7kg at a distance 0.09m from the right bearing. Find the value of the critical speed by using Dunker ley's method if $E = 2 \times 10^{11} \text{N/m}^2$. [16M]

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Code No: **R31011/R10**

III B.Tech I Semester Supplementary Examinations, Nov - 2015
DESIGN & DRAWING OF CONCRETE STRUCTURES
(Civil Engineering)

Time: 3 hours

Max. Marks: 75

Answer any ONE question from PART-A
and THREE questions from PART-B

Use of IS: 456-2000 and design charts from SP-16 is allowed.

PART-A

- 1 The floor slab of a room with internal dimensions of 5.5×4.0 m is to carry a live load of 2.5 kN/m^2 and dead load due to flooring, finishing and partitions of 1.5 kN/m^2 . Design the slab if it is simply supported on all four edges when corners are free to lift, Use M20 grade concrete mix and HYSD steel of grade Fe415. Draw reinforcement details. [30]

(OR)

- 2 Design a square isolated footing of uniform thickness for a reinforced concrete square column of size 500 mm transmitting an axial service load of 2800kN. The safe bearing capacity of the soil at the site is 160 kN/m^2 , and the materials to be used are M20 grade concrete and HYSD steel of grade Fe415. Draw reinforcement details. [30]

PART-B

- 3 a) How limit state method differs from ultimate load method? [8]
b) Sketch the various types of shear reinforcement normally provided in practice. [7]
- 4 A rectangular beam is 200mm wide and 500mm deep. It is reinforced with 4 bars of 25mm diameter in compression with an effective cover of 50mm. Determine the area of tension reinforcement needed to make the beam section fully effective. What would be the moment of resistance? Use M20 concrete and Fe 415 steel. [15]
- 5 Design a short column 450 mm square in section to carry an axial load of 850kN with moments of 60 kNm and 40 kNm about two axes at working loads. Assume M20 concrete and Fe-415 steel. Use of SP – 16 permitted. [15]
- 6 A rectangular simply supported beam of span 5m is 300mm×650mm in cross section and is reinforced with 3 bars of 20mm on tension side at an effective cover of 50mm. Determine the short term deflection due to an imposed working load of 25kN/m (excluding self wt). Assume grade of concrete M20 and grade of steel as Fe 415. [15]
- 7 A 250 mm wide and 600 mm deep R.C. beam is reinforced with 2 legged 10mm inclined stirrups at 250 mm c/c with $\alpha = 60^\circ$. Longitudinal steel consists of 4 bars of 20 mm with a cover of 40 mm. If concrete grade is M20 and grade of steel is Fe 415, determine the strength of the section in shear. [15]



III B.Tech I Semester Supplementary Examinations, Nov - 2015**COMPLEX VARIABLES AND STATISTICAL METHODS****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions
All Questions carry equal marks**

- 1 a) Show that $f(z) = z^3$ is analytic for all z ? [5]
 b) Find K such that $f(x, y) = x^3 + 3Kxy^2$ may be harmonic and find its conjugate? [5]
 c) Write the statement of complex potential function? [5]
- 2 a) Evaluate $\int_C (z^2 + 3z + 2) dz$; where C is the arc of the cycloid [7]
 $x = a(\theta + \sin \theta)$; $y = a(1 - \cos \theta)$ between the points $(0, 0)$ and $(a\pi, 2a)$?
 b) Evaluate $\int_C \frac{z}{z^2 + 1} dz$ where C is $|z + \frac{1}{z}| = 2$? [8]
- 3 a) Determine the poles and residues of the function $\frac{z+1}{z^2(z-2)}$ [7]
 b) Evaluate by contour integration $\int_0^\infty \frac{dx}{1+x^2}$ [8]
- 4 a) Find and plot the rectangular region $0 \leq x \leq 1$, $0 \leq y \leq z$ under the transformation [7]
 $w = \sqrt{2e^{i\pi/4}z + (1-2i)}$
 b) Find the bilinear transformation that maps the points $(0, 1, \infty)$ in z -plane into the points $(-1, -2, -i)$ in the w -plane. [8]
- 5 a) Two aeroplanes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that (i) target is hit (ii) both fails to score hits. [7]
 b) Find the probability that out of 100 patients between 84 and 95 inclusive will survive a heart operation given that the chances of survival is 0.9 [8]
- 6 a) Determine the expected number of random samples having their means (i) between 22.39 and 22.41 (ii) greater than 22.42 (iii) less than 22.37, size of the population is 1500, size of the sample is 36, number of samples is 300, population s.d. is 0.48 and population mean is 22.4. [7]
 b) Using the mean of random sample of size 150 to estimate the mean mechanical aptitude of mechanics of a large workshop and assuming $\sigma = 6.2$, what can we assert with 0.99 probability about the maximum size of error. [8]



- 7 a) Write about null hypothesis and testing of hypothesis [7]
b) A sample of 100 iron bars is said to be drawn from a large number of bars whose lengths are normally distributed with mean 4 feet and standard deviation 0.6 feet. If the sample mean is 4.2 feet, can the sample be regarded as truly random sample [8]
- 8 A manager of a Merchandizing firm wishes to test whether its three salesmen A, B, C tend to make sales of the same size or whether they differ in their selling abilities. During a week there have been 14 sale calls; A made 5 calls, B made 4 calls and C made 5 calls. Following are the weekly sales record (in Rs.) of the three salesmen: [15]

A	500	400	700	800	600
B	300	700	400	600	-
C	500	300	500	400	300

Perform the analysis of variance and draw your conclusion.

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III B.Tech I Semester Supplementary Examinations, Nov - 2015

FINITE ELEMENT METHODS

(Common to Mechanical Engineering and Automobile Engineering)

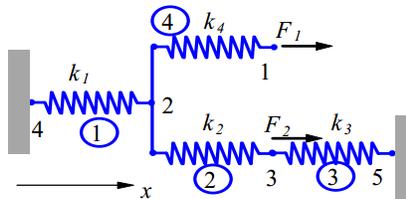
Time: 3 hours

Max. Marks: 75

Answer any FIVE Questions

All Questions carry equal marks

- 1 a) For the spring system shown in the figure find the displacements at the nodes and the reactions. Given $K_1=200$ N/mm, $K_2=K_4=150$ N/mm, $K_3= 200$ N/mm, $F_1=500$ N, $F_2=600$ N. [10]



- b) Write the applications of FEM. [5]
- 2 a) Explain the procedure to handle boundary conditions by using elimination method. [8]
b) Explain the properties of stiffness matrix and discuss banded matrix. [7]
- 3 a) Derive the stiffness matrix of a truss element. [8]
b) Explain how temperature effects are taken into consideration for a truss element. [7]
- 4 a) A fixed beam is loaded with uniformly distributed load of intensity w/m . Assume EI is constant throughout. Analyze the beam by dividing it into two elements and find the following at mid span. [8]
(a) Deflection (b) Slope (c) Shear force (d) Bending moment.
b) Explain the ways in which a three dimensional problem can be reduced to a two dimensional approach give examples. [7]
- 5 a) Discuss a few applications of axi-symmetric elements. [8]
b) What are the properties of constant-strain triangular element? Explain. [7]
- 6 a) Derive the shape functions of two dimensional four noded iso-parametric element. Plot the shape functions. [8]
b) Use Gaussian quadrature with two points to evaluate the integral $\int_{-1}^{+1} \frac{\cos x}{1-2x^2} dx$ [7]

The gauss points are ± 0.5774 and the weights at the two points are equal to unity. Compare the result with actual integral value.

Code No: **R31031/R10**

Set No. 1

- 7 A Steel rod of diameter $d = 2\text{cm}$, length $L = 5\text{ cm}$ and thermal conductivity $k = 50\text{ W/m}^\circ\text{C}$ is exposed at one end to a constant temperature of 320°C . The other end is in ambient air of temperature 20°C with a convection coefficient of $h = 100\text{ W/m}^2\text{ }^\circ\text{C}$. Determine the temperature at the midpoint of the rod. [15]
- 8 a) Discuss Eigen value and Eigen vector analysis. [8]
b) i) Derive the force matrix for uniformly distributed load on a beam. [7]
ii) Write a short note on global coordinates and natural coordinates.



Code No: **R31121**

R10

Set No. 1

III B.Tech I Semester Supplementary Examinations, November - 2015

SOFTWARE ENGINEERING

(Common to IT and ECC)

Time: 3 hours

Max. Marks: 75

**Answer any FIVE Questions
All Questions carry equal marks**

- 1 a) What is Software Engineering? Explain in detail about i) Management myths and ii) Practitioner's myths. [8M]
- b) What are the attributes of good Software? Mention the key challenges facing Software Engineering discuss in detail. [7M]
- 2 a) What is the difference between SRS document and design document? What are the contents we should contain in the SRS document and design document. [8M]
- b) What is Software Process? Explain in detail about all the Process Phases of Waterfall Process Model and state its merits/demerits. [7M]
- 3 a) What is meant by User Interface? What are the three areas that User Interface design focuses? Explain them. [8M]
- b) Discuss in detail about Requirement Engineering tasks. What are the important characteristics that requirements must preserve? Explain how requirements can be managed? [7M]
- 4 a) Explain the steps involved in the Prototyping. [8M]
- b) Explain about the Incremental Model. [7M]
- 5 a) Explain the Design Principles. [8M]
- b) Define Data Modeling & Data Object. Mention the objectives of Analysis modeling? [7M]
- 6 a) Explain the Size-Oriented metrics with an example. [8M]
- b) Discuss any four useful indicators for Software Quality. [7M]
- 7 a) What are the Testing Principles the Software Engineer must apply while performing the Software Testing? [8M]
- b) State and explain various Debugging Tactics. [7M]
- 8 Discuss the following: [4M]
 - i) Software Project Planning [4M]
 - ii) Objectives of Requirement Analysis [4M]
 - iii) SQA Plan [3M]
 - iv) Registration process of ISO 9000 certification



III B.Tech I Semester Supplementary Examinations, Nov - 2015**DESIGN OF REINFORCED CONCRETE STRUCTURES****(Civil Engineering)****Time: 3 hours****Max. Marks: 80****Answer any ONE question from PART-A
and THREE questions from PART-B****Use of IS: 456-2000 and design charts from SP-16 is allowed.*************PART-A**

- 1 The floor slab of a room with internal dimensions of 5.5×4.0 m is to carry a live load of 2.5 kN/m^2 and dead load due to flooring, finishing and partitions of 1.5 kN/m^2 . Design the slab if it is simply supported on all four edges when corners are free to lift, Use M20 grade concrete mix and HYSD steel of grade Fe415. Draw reinforcement details. [32]

(OR)

- 2 Design a square isolated footing of uniform thickness for a reinforced concrete square column of size 500 mm transmitting an axial service load of 2800kN. The safe bearing capacity of the soil at the site is 160 kN/m^2 , and the materials to be used are M20 grade concrete and HYSD steel of grade Fe415. Draw reinforcement details. [32]

PART-B

- 3 a) How limit state method differs from ultimate load method? [8]
b) Sketch the various types of shear reinforcement normally provided in practice. [8]
- 4 A rectangular beam is 200mm wide and 500mm deep. It is reinforced with 4 bars of 25mm diameter in compression with an effective cover of 50mm. Determine the area of tension reinforcement needed to make the beam section fully effective. What would be the moment of resistance? Use M20 concrete and Fe 415 steel. [16]
- 5 Design a short column 450 mm square in section to carry an axial load of 850kN with moments of 60 kNm and 40 kNm about two axes at working loads. Assume M20 concrete and Fe-415 steel. Use of SP – 16 permitted. [16]
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