

CBCS SCHEME

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17ME51

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023 Management and Engineering Economics

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Interest factors table is permitted.

Module-1

- 1 a. Define meaning of Management and explain the functions of Management. (10 Marks)
b. Explain the contributions of "Henry Fayal" fourteen principles. (10 Marks)

OR

- 2 a. Discuss the importance and purpose of planning process. (10 Marks)
b. With the help of block diagram, explain Hierarchy of plans. (10 Marks)

Module-2

- 3 a. List and explain in brief the principles of organization. (10 Marks)
b. Explain the process of selection and recruitment. (10 Marks)

OR

- 4 a. Discuss the three types of leadership styles mentioning their advantages and disadvantages. (10 Marks)
b. With the aid of block diagram, explain Maslow's Hierarchy of needs theory. (10 Marks)

Module-3

- 5 a. Define "engineering economics" and with a block diagram explain problem solving and decision making. (10 Marks)
b. A person takes a loan of Rs. 10,000 from a Bank of interest of 10% per year. Find the amount, if
(i) Interest is compounded annually (ii) Interest is compounded half yearly.
(iii) Interest is compounded quarterly (iv) Interest is compounded monthly (10 Marks)

OR

- 6 a. Differentiate between the following :
(i) Microeconomics and macroeconomics (ii) Price elasticity and income elasticity (10 Marks)
Find the effective rate of interest for and actual rate of interest of 10% when compounded.
b. (i) Yearly (ii) Biannually (iii) Monthly (iv) Daily (v) Hourly (10 Marks)

Module-4

- 7 a. A company needs a mini-bus to bring its employees to work and take them home. It has two alternatives.
(i) To rent a vehicle for a payment of Rs. 3 lakhs per year for the next 5 years.
(ii) To buy a second hand vehicle for Rs. 3 lakhs with an operating and maintenance cost of Rs. 2 lakhs per year. The salvage value of the vehicle after the five year would be about 1 lakh.
Select the best alternative based on present worth method of comparison using an interest rate of 13% compounded annually. (10 Marks)
b. Explain MARR, IRR and ERR. (10 Marks)

OR

- 8 a. A fresh mechanical engineer wants to become an entrepreneur. He starts a (CAD) centre to give design solutions to small-scale industries. He expects that his software and business would last for 5 years. The initial outlay and cash flow pattern for the new business are as listed below. Find the internal rate of return for the new business if he estimates a salvage value of Rs. 1,00,000 at the end of 5 years.

Period	0	1	2	3	4	5
Cash flow	-70000	180000	190000	210000	225000	200000

(10 Marks)

- b. A standby lighting generator is required for a shop. Two types are available.

Period	Type-1	Type-2
First cost	Rs.5000	Rs.3200
Salvage value	Rs.1000	Nil
Annual Operating costs	Rs.780	Rs.950

If both generators have a life of 4 years and the interest rate is 15 percent, per year. Which offers the lowest equivalent annual cost? (10 Marks)

Module-5

- 9 a. List and explain the elements of product cost. (10 Marks)
- b. The following diagram Fig.Q9(b) shows the "Lathe dead centre", along with its dimensions, to be manufactured for a particular lathe. Estimate its weight and cost of material if cast iron is used to make it. Take density of CI as 7787 kg/m^3 and material cost as Rs.58 per kg.

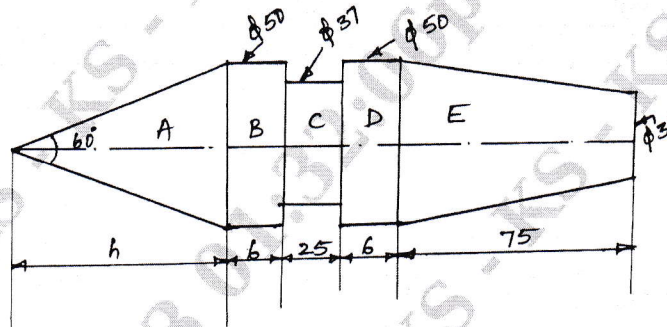


Fig.Q9(b)

(10 Marks)

OR

- 10 a. List and explain five methods of depreciation charges. (10 Marks)
- b. Computers purchased by a public utility cost Rs.7000 each. Past records indicate that they have useful life of 5 years, after which, they will be disposed of, with no salvage value. The company currently has cost of capital of 7%. Determine the following by using straight line method.
- Depreciation charge per year
 - Depreciation reserve accumulated at the end of year 3.
 - Book value at the end of third year.

(10 Marks)

CBCS SCHEME

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17ME52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023 Dynamics of Machinery

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. State the condition for static equilibrium of a body subjected to a system for (i) Two forces (ii) Three forces (iii) Member with two force and torque. (08 Marks)
- b. For the 4 bar mechanism shown in Fig. Q1 (b), find the required torque T_2 and various P in forces on the links for the equilibrium of the system.

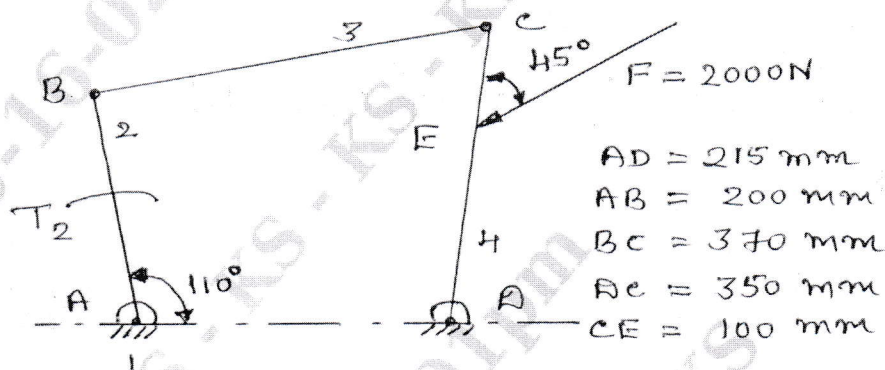


Fig. Q1 (b)

(12 Marks)

OR

- 2 a. Explain D'Alembert's principle and discuss on its significance. (06 Marks)
- b. The crank and the connecting rod of a vertical single cylinder gas engine running at 1800 rpm are 60 and 240 mm respectively. The diameter of the piston is 80 mm and the mass of reciprocating parts is 1.2 kg. At a point during the power stroke when the piston has moved 20 mm from the top dead center position, the pressure on the piston is 800 kN/m^2 , determine the
- Net force on the piston
 - Thrust in the connecting rod.
 - Thrust on the sides of cylinder walls
 - Engine speed at which the above values are zero.
- (14 Marks)

Module-2

- 3 a. Briefly explain the static and dynamic balancing. (04 Marks)
- b. A shaft carries 4 rotating masses A, B, C and D in this order along the axis. The mass A may be assumed to be concentrated at 160 mm radius, B at 180 mm, C at 200 mm and D at 120 mm radius. The masses B, C and D are 40, 30 and 50 kg respectively. The planes containing B and C are 300 mm apart. The angular spacings of C and D are 90° and 210° respectively with respect to B measured in the same direction. If the shaft and masses are to be in complete dynamic balance determine (i) Mass and angular position of A (ii) Position of planes A and D. (16 Marks)

OR

- 4 a. What do you mean by primary and secondary unbalance in reciprocating engines?(04 Marks)
 b. The cranks and connecting rod of a 4 cylinder in Line engine running at 1800 rpm and are 50 mm, 250 mm each respectively and the cylinder are spaced 150 mm apart. If the cylinders are numbered 1 to 4 in sequence from one end and the cranks appear at intervals of 90° in an end view in the order 1 – 4 – 2 – 3. The reciprocating mass corresponding to each cylinder is 1.5 kg. Determine
 (i) Unbalanced primary and secondary forces if any.
 (ii) Unbalanced primary and secondary couples.
 with reference to central plane of engine. (16 Marks)

Module-3

- 5 a. Derive the expression for speed of a porter governor with usual notations taking friction into account. (08 Marks)
 b. A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the range of speed, sleeve lift, governor effort and power of the governor in the following cases :
 (i) When the friction at the sleeve is neglected.
 (ii) When the friction at the sleeve is equivalent to 10 N. (12 Marks)

OR

- 6 a. Explain the effect of Gyroscopic couple of a ship under, (i) Steering (ii) Pitching (iii) Rolling. (08 Marks)
 b. An aeroplane make a complete half circle of 40 m radius towards left when flying at 175 km/hr. The mass of the rotary engine and propeller is 400 kg with the radius of gyration 300 mm. The engine runs at 2500 rpm clockwise when viewed from rear. Find the gyroscopic couple on the aircraft. What will be the effect if the aeroplane turn towards right instead of left. (12 Marks)

Module-4

- 7 a. Define the following terms :
 (i) Periodic motion.
 (ii) Amplitude
 (iii) Natural frequency
 (iv) Resonance
 (v) Degrees of freedom. (10 Marks)
 b. Add the following harmonic motions analytically and check the solution graphically,
 $X_1 = 2 \cos(\omega t + 0.5)$
 $X_2 = 5 \sin(\omega t + 1.0)$ (10 Marks)

OR

- 8 a. Explain the energy method and Rayleigh's method of finding natural frequency of spring mass system. (12 Marks)

- b. Find the natural frequency of a system shown in Fig. Q8 (b).

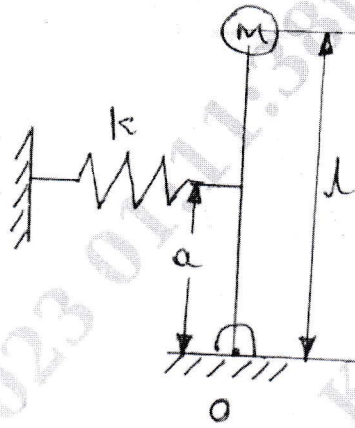


Fig. Q8 (b)

(08 Marks)

Module-5

- 9 a. Set up a differential equation for a spring mass damper system and obtain complete solution for a over damped system. (12 Marks)
- b. The mass of a single degree damped vibrating is 7.5 kg makes 24 free oscillation in 14 secs, when distributed from its equilibrium position. The amplitude of vibration reduces 0.25 of its initial value after 5 oscillations. Determine :
- (i) Stiffness of spring (ii) Logarithmic decrement (iii) Damping factor. (08 Marks)

OR

- 10 a. Define Magnification factor and explain its significance. (10 Marks)
- b. A machine of total mass 17 kg is mounted on springs having stiffness $K = 11000 \text{ N/cm}$. A piston within the machine has a mass of 2 kg has a reciprocating motion with stroke 7.5 cm and speed 6000 rpm. Assuming the motion to be S.H.M, determine
- (i) Amplitude of machine
- (ii) Transmitting.
- (iii) Force transmitted to the ground or foundation,
- Take $\xi = 0.2$. (10 Marks)

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17ME53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023 Turbomachines

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Heat Transfer data handbook is permitted.*

Module-1

- 1 a. Define the following for turbomachine:
(i) Specific speed (ii) Flow coefficient
(iii) Energy coefficient (iv) Speed ratio (10 Marks)
- b. An output of 10 KW was recorded on a turbine, 0.5 diameter, revolving at a speed of 800 rpm, under a head of 20 m. What is the diameter and output of another turbine which works under a head of 180 m at a speed of 200 rpm when their efficiencies are same? Find the specific speed and name the turbine can be used. (10 Marks)

OR

- 2 a. Define polytropic efficiency of turbine. Show that the polytropic efficiency during expansion process is given by:

$$\eta_p = \frac{\ln \left[\frac{T_2}{T_1} \right]}{\frac{\gamma - 1}{\gamma} \ln \left[\frac{p_2}{p_1} \right]} \quad (10 \text{ Marks})$$

- b. A nine stage centrifugal compressor has an overall pressure ratio of 2.82. Air enters the compressor at a pressure of 1 bar and 17°C the stage efficiency is 0.9. Determine:
(i) Pre heat factor (ii) Overall efficiency (iii) Polytropic efficiency (10 Marks)

Module-2

- 3 a. Derive an expression for the alternative form of Euler's turbine equation. (10 Marks)
b. Obtain an expression for utilization factor of a turbomachine interms of inlet and outlet absolute velocity of the fluid and degree of reaction. (10 Marks)

OR

- 4 a. Derive an expression for maximum utilization factor for axial flow type of impulse turbine and 50% reaction turbine. (10 Marks)
b. Draw the inlet and outlet triangles for an axial flow compressor for which given :
(i) Degree of reaction = 0.5
(ii) Inlet blade angle = 40°
(iii) Axial velocity of flow which is constant throughout = 125 m/s
(iv) RPM = 6500
(v) Radius 0.2 m

Calculate the power required in KW at an air flow rate of 15 kg/s. Find fluid angles at inlet and outlet. Assume blade speed is same at inlet and outlet. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Name the different compounding methods and explain any one. (10 Marks)
- b. A single stage impulse turbine has a diameter of 1.5 m and running at 3000 rpm. The nozzle angle is 20° , speed ratio is 0.45. Ratio of relative velocity at the outlet to that at inlet is 0.9. The outlet angle of the blade is 3° less than inlet angle. Steam flow rate is 6 kg/s. Draw the velocity triangles and find the following:
- (i) Velocity of whirl (ii) Axial thrust
(iii) Blade angles (iv) Power developed (10 Marks)

OR

- 6 a. Explain the following:
- (i) Nozzle efficiency (ii) Diagram efficiency
(iii) Stage efficiency (iv) Axial thrust (10 Marks)
- b. Derive an expression for maximum blade efficiency in an impulse steam turbine. (10 Marks)

Module-4

- 7 a. Show that for maximum utilization the speed ratio is 0.5 for pelton wheel. (10 Marks)
- b. Define the following with reference to hydraulic turbines:
- (i) Overall efficiency (ii) Hydraulic efficiency
(iii) Mechanical efficiency (iv) Volumetric efficiency (10 Marks)

OR

- 8 a. Draw a neat sketch of Francis turbine. Explain different types of draft tube. Draw typical velocity triangles for Francis turbine. (10 Marks)
- b. A double jet pelton wheel is required to generate 7500 KW under a head of 400 m. The deflection of jet is 165° and the relative velocity of the jet is reduced by 15% in passing over the buckets. Find:
- (i) The diameter of each jet
(ii) Total flow
(iii) Force exerted by the jets in the tangential direction.
- Assume generator efficiency is 95%, $\eta_0 = 80\%$, speed ratio = 0.47. (10 Marks)

Module-5

- 9 a. Explain the following with reference to centrifugal pump:
- (i) Manometric efficiency (ii) Cavitation (iii) Need of priming
(iv) Pumps in series (v) Mechanical efficiency (10 Marks)
- b. Derive an expression of pressure rise in the impeller of centrifugal pump. (10 Marks)

OR

- 10 a. Define the following:
- (i) Pre whirl (ii) Surging (iii) Slip factor (iv) Choking (10 Marks)
- b. An air compressor has eight stages of equal pressure ratio of 1.35. The flow rate and overall efficiency are 50 kg/s and 82% respectively if the conditions of air at entry are 1 bar and 40°C , determine:
- (i) The state of air at the compressor exit
(ii) Polytropic efficiency
(iii) Efficiency of each stage (10 Marks)

CBCS SCHEME

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17ME54

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023

Design of Machine Elements – I

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of design data hand book is permitted.
3. Missing data, if any, may be suitably assumed.

Module-1

- 1 a. Explain : i) Standards and codes ii) Meaning of FG200 SG400/15 (06 Marks)
b. Briefly explain the process of mechanical engineering design. (04 Marks)
c. Determine the max tensile and maximum shear stress for the Fig.Q1(c) shown below :

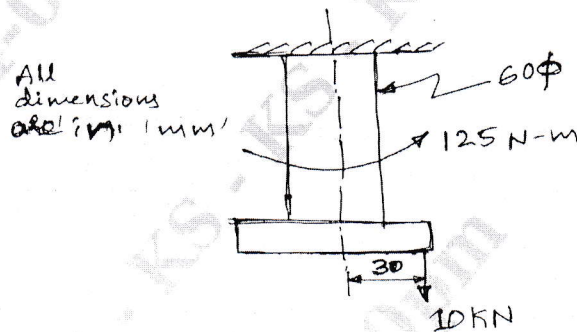


Fig Q1(c)

(10 Marks)

OR

- 2 a. Define stress concentration and explain any two methods to reduce stress concentrations with sketches. (06 Marks)
b. Determine the maximum stresses in the following cases :
i) A rectangular plate of 50mm × 80mm with a hole of 10mm diameter in the center is loaded in axial tension of 10kN. Thickness of plate is 10mm.
ii) A circular shaft of 45mm diameter stepped down to 30mm diameter having a fillet radius 6mm subjected to a twisting moment of 150N-m. (14 Marks)

Module-2

- 3 a. A cantilever beam of width 50mm depth 150mm is 1.5m long. It is struck by a weight of 1000N that from a height of 10mm at its free end. Determine the following :
i) Impact factor
ii) Instantaneous maximum deflection
iii) Instantaneous maximum stress
iv) Instantaneous maximum load. Take $E = 20.6 \times 10^4 \text{ N/mm}^2$. (10 Marks)
b. A 5kg block is dropped from a height of 200mm on to a beam as shown in Fig.Q3(b). The material has an allowable stress of 50MPa. Determine the dimensions of the rectangular cross section whose depth is 1.5 times the width. Take $E = 70 \text{ GPa}$.

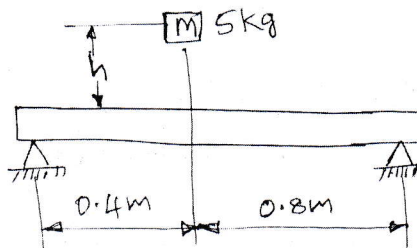


Fig.Q3(b)

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 4 a. Explain about cumulative fatigue damage. (05 Marks)
 b. Determine the maximum load for simply supported beam cyclically load as shown in Fig.Q4(b). The ultimate strength is 700MPa, the yield point in tension is 520MPa and the endurance limit in reversed bending is 320MPa. Use a factor of safety of 1.25. The load, size and surface correction factors are 1, 0.75 and 0.9 respectively.

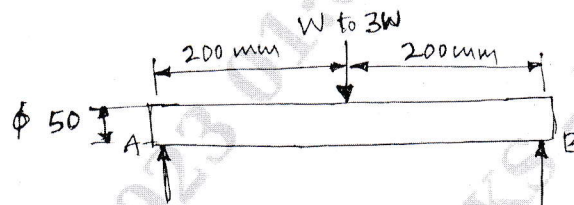


Fig.Q4(b)

(15 Marks)

Module-3

- 5 A shaft is supported by two bearings placed 1100mm apart. A pulley of diameter 620mm is keyed at 400mm to the right from the left hand bearing and this drives a pulley directly it with a maximum tension of 2.75kN. Another pulley of diameter 400mm is placed 200mm to the left of right hand bearing and is driven with a motor placed horizontally to the right. The angle of contact of the pulley is 180° and $\mu = 0.3$. Find the diameter of the shaft. Assume $C_m = 3$, $C_t = 2.5$, $\sigma_y = 190$ MPa and $\sigma_{ut} = 300$ MPa. (20 Marks)

OR

- 6 a. A rectangular sunk key 14mm wide, 10mm thick and 75mm long is required to transmit 1200N-m torque from a 50mm diameter solid shaft. Determine whether the length is sufficient or not if the permissible shear stress and compressive stresses are limited to 56MPa and 168MPa. (06 Marks)
 b. Design an old ham's coupling to transmit 5KW of power at 1000rpm. Maximum allowable pressure between the faces of the slots and the torque is 8N/mm^2 . The allowable value of shear stress and compressive stress for the shaft and key material may be taken as 40N/mm^2 and 80N/mm^2 respectively. (14 Marks)

Module-4

- 7 a. Two plates of 10mm thick each are to be joined by means of a single riveted double strap butt joint. Determine the diameter of the rivet, pitch, strap thickness and efficiency of the joint. Take $\sigma_t = 80$ MPa and $\tau = 60$ Mpa. (10 Marks)
 b. A riveted joint is consisting of four identical rivets is subjected to an eccentric force of 5kN as shown in Fig.Q7(b). Determine the diameter of rivets, if the permissible shear stress is 60MPa.

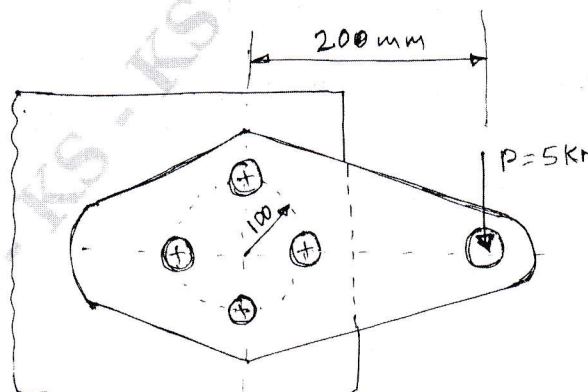


Fig.Q7(b)

(10 Marks)

OR

- 8 a. A 80mm wide 12mm thick plate carrying an axial load of 96kN is welded to a support as shown in Fig.Q8(a). The allowable tensile and shear stress in the weld are 100MPa and 70MPa respectively. Find the length of each parallel fillet weld, for static : loading and dynamic loading cases.

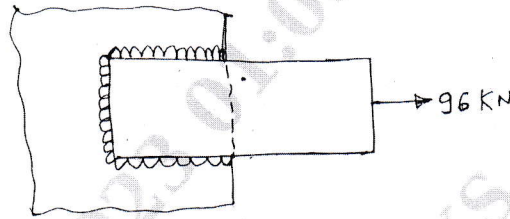


Fig.Q8(a)

(10 Marks)

- b. A 16mm thick plate is welded to a vertical support by two fillet welds as shown in Fig.Q8(b). Determine the size of weld, if the permissible shear stress for the weld material is 75MPa.

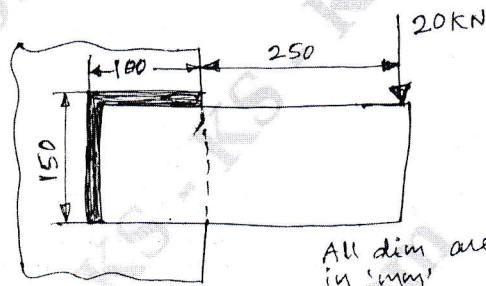


Fig.Q8(b)

(10 Marks)

Module-5

- 9 a. A flat circular plate is used to close the flanged end of a pressure vessel of internal diameter 300mm. The vessel carries a fluid at a pressure of 0.7N/mm^2 . A copper asbestos gasket is used to make the joint leak proof. Twelve bolts are used to fasten the cover plate on to the pressure vessel. Find the size of the bolts so that the stress in the bolt is not to exceed 100N/mm^2 . (10 Marks)
- b. A bracket is bolted as shown in Fig.Q9(b). All the bolts are identical and have yield strength of 400MPa. Determine the size of bolts. Use FOS = 3.

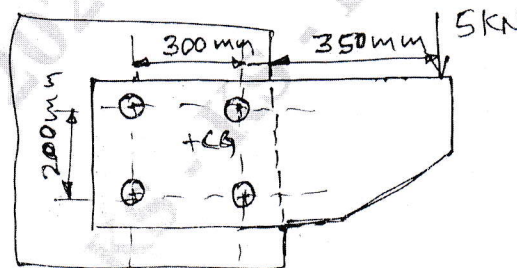


Fig.Q9(b)

(10 Marks)

OR

- 10 a. Explain self locking in power screw and derive an equation for torque required to raise the load on a square thread. (10 Marks)
- b. The square thread of a screw jack with a specification of 80×16 , with a double start is to raise a load of 100kN. The mean collar diameter is 130mm the co-efficient of friction for the threads and collar are 0.1 and 0.12 respectively. Determine :
 i) Torque required to raise the load
 ii) Efficiency of the screw. (10 Marks)

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Fifth Semester B.E. Degree Examination, Jan./Feb. 2023 Non-Traditional Machining

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Briefly explain the selection process of NTM processes. (10 Marks)
- b. Suggest the correct NTM process for following work materials and shapes of work pieces:
- Aluminium
 - Super alloys
 - Titanium
 - Refractories
 - Ceramic
 - Glass
 - Plastic
 - Deep holes $\frac{L}{D} > 20$
 - Pocketing
 - Double contouring. (10 Marks)

OR

- 2 a. Give detailed classification of NTM processes with respect to type of energy, transfer media, energy source, M/sm of material removal. (10 Marks)
- b. Write the applications and advantages of NTM processes. (10 Marks)

Module-2

- 3 a. Explain in detail the process characteristics of USM process (USM-Ultrasonic machining process). (10 Marks)
- b. List and explain the process parameters of USM. (10 Marks)

OR

- 4 a. Explain in detail the complete variables of Abrasive Jet Machining process (AJM). (10 Marks)
- b. Explain with a neat sketch Water Jet Machining (WJM process). (10 Marks)

Module-3

- 5 a. Explain the electrochemical grinding process with a neat sketch. (10 Marks)
- b. Explain in detail the process parameters of Electrochemical Machining Process (ECM). (10 Marks)

OR

- 6 a. With a help of block diagram explain the Chemical Milling process (CHM). (10 Marks)
- b. Write the applications and disadvantages of CHM process. (10 Marks)

Module-4

- 7 a. Explain with a neat sketch spark erosion power generator for EDM equipment. (10 Marks)
b. Explain the following types of flushing with respect to EDM process: (10 Marks)
i) Suction flushing ii) Side flushing.

OR

- 8 a. Explain the modes of operation of plasma torch with neat sketches. (10 Marks)
b. Write the advantages, disadvantages and applications of PAM process. (10 Marks)

Module-5

- 9 a. Write the advantages and limitations of Laser Beam Machining process (LBM). (10 Marks)
b. With a neat sketch, explain the generation of LASER. (10 Marks)

OR

- 10 a. Explain with a neat sketch the working of electron beam machining process. (10 Marks)
b. Write the advantages and disadvantages of EBM process. (10 Marks)

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17ME562

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023 Energy and Environment

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. How the Energy sources are classified? Discuss the World Energy Scenario of sources with respect to production, consumption with conclusions. (10 Marks)
- b. Briefly explain the various parameters which has a effect on key energy trends in India. (10 Marks)

OR

- 2 a. Explain the various factors that contribute for India's Energy Development. (10 Marks)
- b. Mention the key aspects of Emerging Energy vision which play a critical role in India's Energy outlook. (10 Marks)

Module-2

- 3 a. List the different types of Energy Storage Systems. Explain any one thermal Energy Storage System with a neat sketch. (10 Marks)
- b. What do you mean by Energy Audit? Explain the need for Energy Audit. (10 Marks)

OR

- 4 a. What is Energy Management? List the principles of Energy Management. (10 Marks)
- b. Calculate cost of generation per KWh for a power station having the following data :
Installed capacity of the plant = 200 MW ; Capital cost = Rs 400 crores ;
Rate of Interest and depreciation = 12% ;
Annual cost of fuel , salaries and taxation = Rs 5 crores ; Load factors = 50%.
Also estimate the savings in cost per KWh if annual load factor is raised to 60%. (10 Marks)

Module-3

- 5 a. Define Environment. Mention its scope. Discuss the importance of public awareness in relation to environment. (10 Marks)
- b. Discuss the carbon cycle utilization in our Ecosystem. (10 Marks)

OR

- 6 a. What is an Ecosystem? Discuss Forest Ecosystem. Explain how conservation of forest can be done. (10 Marks)
- b. Write a short notes on : i) Desert Ecosystem ii) Aquatic System. (10 Marks)

Module-4

- 7 a. Briefly discuss the causes , effects and control measures of air pollution. (10 Marks)
- b. Enumerate the causes of water pollution and its effects. Explain the control measures that can be initiated for mitigating the same. (10 Marks)

OR

- 8 a. Discuss on Solid Waste Management Techniques. (10 Marks)
b. Enumerate the role of an Individual in prevention of pollution. (10 Marks)

Module-5

- 9 a. Discuss how climate change is affecting the race. (10 Marks)
b. Explain the Impact of Global Warming on our Earth. (10 Marks)

OR

- 10 a. Discuss on Environmental Protection Act and mention its features. (10 Marks)
b. Write short notes on :
i) Wild Life Protection Act ii) Forest Conservation Act. (10 Marks)

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